State of Arizona Exceptional Event Documentation for Wildfire-Caused Ozone Exceedances on July 7, 2017 in the Maricopa Nonattainment Area

Produced by:

Arizona Department of Environmental Quality
Maricopa County Air Quality Department
Maricopa Association of Governments

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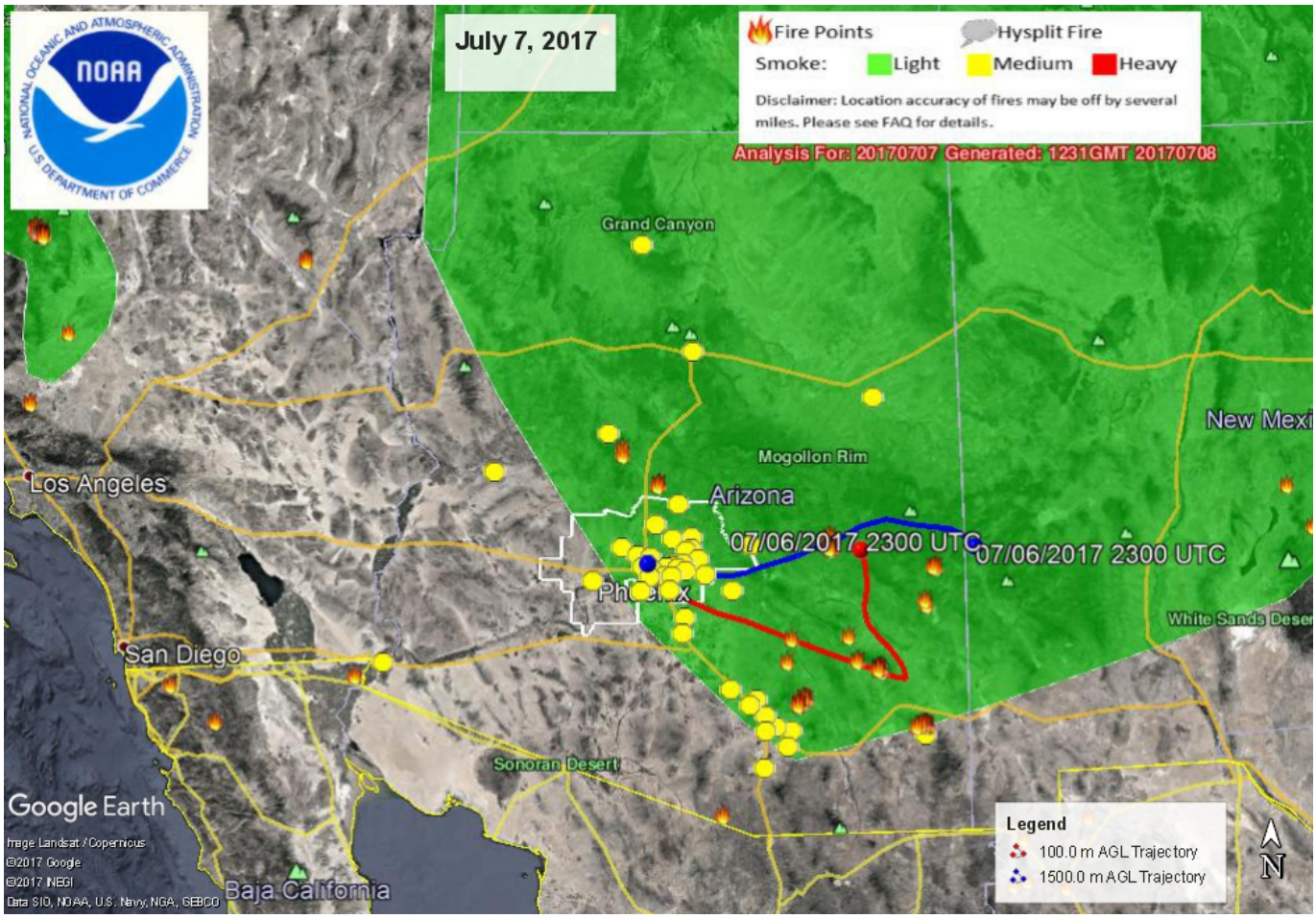

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I. INTRODUCTION

This documentation is being submitted to EPA to demonstrate that exceedances of the 2008 ozone standard at nine monitors in the Maricopa eight-hour ozone nonattainment area on July 7, 2017 should be excluded from use in determinations of exceedances or violations of the 2008 ozone National Ambient Air Quality Standards (NAAQS) as exceptional events caused by a wildfire. This documentation serves to meet the requirements of Clean Air Act Section 319(b) (Air quality monitoring data influenced by exceptional events); the EPA final rule, *Treatment of Data Influenced by Exceptional Events* (81 FR 68216), as codified in 40 CFR Sections 50.1 and 50.14.; and EPA's final September 2016 *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations* (Wildfire Guidance).

Summary of the Exceptional Event

During the period of July 1-7, 2017, wildfires burning primarily in the southeastern portion of Arizona produced smoke, ozone and ozone precursor emissions. These emissions accumulated over time in southeastern Arizona, as airflow patterns on July 1-5, 2017 largely confined these emissions to southeastern Arizona. On July 6, 2017, airflow patterns began to shift from coming out of the southwest to coming out of the southeast. As this airflow shift occurred, the smoke, ozone and ozone precursor emissions from the wildfires were transported into the Maricopa nonattainment area during the evening of July 6, 2017 and throughout the day of July 7, 2017. The increased levels of ozone and ozone precursor emissions from the wildfires resulted in enhanced ozone production across the Maricopa nonattainment area, causing nine monitoring sites to exceed the 2008 ozone standard of 0.075 ppm on July 7, 2017. The nine exceeding sites are listed in Table 1–1. Satellite photos of smoke production, visibility reductions in the Maricopa nonattainment area, spatial patterns of ozone concentrations, and analysis of the altered diurnal concentrations of ozone, NOx, CO, and $PM_{2.5}$ as a result of the wildfire emissions indicate that ozone and ozone precursor emissions from the wildfires were transported to the exceeding monitors and confirm a clear causal relationship between the exceeding monitors and the wildfires. Analysis of similar meteorological days in July when ozone exceedances did and did not occur in the Maricopa nonattainment area provide additional evidence that the exceedances on July 7, 2017 were unique and would normally not have occurred but for the presence of the additional ozone and ozone precursor emissions from the wildfires.

Table 1-1. Ozone Monitors Affected by the Wildfire Exceptional Event.

Monitor Name	County	Operating Agency	Monitor ID	Exceeding Ozone Concentration
Central Phoenix	Maricopa	Maricopa County Air Quality Department	04-013-3002	0.078 ppm
Dysart	Maricopa	Maricopa County Air Quality Department	04-013-4010	0.087 ppm
Glendale	Maricopa	Maricopa County Air Quality Department	04-013-2001	0.079 ppm
Mesa	Maricopa	Maricopa County Air Quality Department	04-013-1003	0.078 ppm
North Phoenix	Maricopa	Maricopa County Air Quality Department	04-013-1004	0.085 ppm
Phoenix Supersite	Maricopa	Arizona Department of Environmental Quality	04-013-9997	0.086 ppm
Pinnacle Peak	Maricopa	Maricopa County Air Quality Department	04-013-2005	0.077 ppm
South Phoenix	Maricopa	Maricopa County Air Quality Department	04-013-4003	0.077 ppm
West Phoenix	Maricopa	Maricopa County Air Quality Department	04-013-0019	0.084 ppm

Statutory and Regulatory Requirements

Clean Air Act Section 319(b) defines an exceptional event as an event that:

(i) affects air quality;
(ii) is not reasonably controllable or preventable.;
(iii) is an event caused by human activity that is unlikely to recur at a particular location or a natural event; and
(iv) is determined by the Administrator through the process established in the regulations promulgated under paragraph (2) [Regulations] to be an exceptional event.

EPA regulation in 40 CFR Section 50.1(j) further defines an exceptional event as:

> "...an event(s) and its resulting emissions that affect air quality in such a way that there exists a clear causal relationship between the specific event(s) and the monitored exceedance(s) or violation(s), is not reasonably controllable or preventable, is an event(s) caused by human activity that is unlikely to recur at a particular location or a natural event(s), and is determined by the Administrator in accordance with 40 CFR 50.14 to be an exceptional event. It does not include air pollution relating to source noncompliance. Stagnation of air masses and meteorological inversions do not directly cause pollutant emissions and are not exceptional events. Meteorological events involving high temperatures or lack of precipitation (*i.e.,* severe, extreme or exceptional drought) also do not directly cause pollutant emissions and are not considered exceptional events. However, conditions involving high temperatures or lack of precipitation may promote occurrences of particular types of exceptional events, such as wildfires or high wind events, which do directly cause emissions."

EPA regulation in 40 CFR Section 50.14(c)(3)(iv) states that a demonstration to justify the exclusion of monitor data as an exceptional event must include:

A. A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s);
B. A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;
C. Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times to support the requirement at paragraph (c)(3)(iv)(B) [clear causal relationship] of this section. The Administrator shall not require a State to prove a specific percentile point in the distribution of data;
D. A demonstration that the event was both not reasonably controllable and not reasonably preventable; and
E. A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event.

Additionally, specific regulatory requirements related to demonstrations for wildfire events are included in 40 CFR Section 50.14(b)(4). Details on how the statutory and regulatory requirements are addressed in this documentation are presented in the bulleted list below:

- Section II of this assessment includes a conceptual model that describes the genesis and location of the wildfires and how ozone and ozone precursor emissions from the wildfires caused the ozone exceedances on July 7, 2017 in the Maricopa nonattainment area.

- Section III provides a detailed body of evidence to support the clear causal relationship between the emissions from the wildfires and the ozone exceedances in the Maricopa nonattainment area and that the event affected air quality. This section includes an evaluation of the event to the tiered demonstration levels in EPA's Wildfire Guidance document, comparisons of event concentrations to historical ozone season concentrations, HYSPLIT back trajectories showing transport of wildfire emissions to the nonattainment area, satellite photos of wildfire smoke, regional rises in ozone concentrations, smoke impacts as seen in visibility photos, and non-typical diurnal concentrations of ozone NO_2, $PM_{2.5}$ and CO. This section also includes an analysis that the meteorological conditions that existed On July 7, 2017 were not sufficient to solely cause the exceedances on July 7, 2017; and an analysis showing the substantial difference in nature and in cause between non-event exceedances in July 2013-2017 as compared to the wildfire-caused exceedances on July 7, 2017. These additional analyses serve to bolster the evidence presented to satisfy the clear causal relationship requirement.

- Section IV presents evidence that the event was a natural event and that the event was neither reasonably controllable nor preventable.

- Section V includes a summary of the evidence presented in Sections II-IV.

Procedural Requirements

The procedural requirements for submitting a demonstration to EPA for an exceptional event are included in 40 CFR Section 50.14(c). The procedural requirements include the schedules and procedures for notifying the public when an event occurs; for providing EPA with the initial notification of a potential exceptional event; and for documenting the public comment process. Specific procedural requirements are presented below:

- 40 CFR Section 50.14(c)(1)(i) – Public notification that event was occurring:

  The Arizona Department of Environmental Quality (ADEQ) issued ensemble air quality forecasts for the Greater Phoenix area on July 6-7, 2017 discussing the possibility of high ozone concentrations and issuing a High Pollution Advisory for July 7, 2017. The forecast products that were issued on July 6-7, 2017 are included in Appendix A.

- 40 CFR Section 50.14(c)(2)(i) – Initial notification of potential exceptional event by creating an initial event description and flagging the associated data that have been submitted to the AQS database:

The Maricopa County Air Quality Department (MCAQD) and the Arizona Department of Environmental Quality (ADEQ) have created an initial event description (wildfire) and flagged the associated air quality monitoring data for July 7, 2017 as an exceptional event in AQS. The following monitors have been flagged as exceeding the 2008 ozone standard on July 7, 2017 as a result of a wildfire event:

Central Phoenix (04-013-3002); Dysart (04-013-4010); Glendale (04-013-2001); Mesa (04-013-1003); North Phoenix (04-013-1004); Phoenix Supersite (04-013-9997); Pinnacle Peak (04-013-2005); South Phoenix (04-013-4003); and West Phoenix (04-013-0019)

- 40 CFR Section 50.14(c)(2)(i)(A) – Regular communication with the EPA Regional office to identify data that have been potentially influenced by an exceptional event, to determine whether the identified data may affect a regulatory determination and to discuss whether the State should develop and submit an exceptional events demonstration:

  ADEQ began initial discussions with EPA about this event on November 9, 2017. From that date, discussions continued with EPA on the development of documentation needed to support the event. ADEQ submitted formal initial notification of the July 7, 2017 wildfire event to EPA Region IX on March 27, 2018. A copy of the initial notification letter and form are included in Appendix E.

- 40 CFR Section 50.14(c)(2)(i)(B) – For data that may affect an anticipated regulatory determination or where circumstances otherwise compel EPA to prioritize the resulting demonstration, EPA shall respond to the State's initial notification with a demonstration due date:

  EPA did not provide a due date for this demonstration.

- 40 CFR Section 50.14(c)(2)(i)(C) – EPA may waive the initial notification of potential exceptional event process on a case-by-case basis:

  EPA did not waive the initial notification of potential exceptional event process.

- 40 CFR Section 50.14(c)(3)(v) – With submission of the demonstration containing the elements in 40 CFR Section 50.14(c)(3)(iv), the State must document that a public comment process was followed, submit any public comments received, and address in the submission to EPA those comments disputing or contradicting factual evidence provided in the demonstration:

  ADEQ posted this assessment report on the ADEQ webpage and placed a hardcopy of the report in the ADEQ Records Management Center for public review. ADEQ opened a 30-day public comment period on May 17, 2018. In order to speed the review and approval of this exceptional event demonstration by EPA Region IX, ADEQ is following a parallel processing procedure whereby this demonstration was submitted to EPA for review and approval on the same day as the opening of the public comment period. A copy of the public notice certification, along with any comments received and responses to those comments, will be submitted to EPA, consistent with the requirements of 40 CFR Section 50.14(c)(3)(v). See Appendix D for a copy of the affidavit of public notice.

Mitigation Requirements

Because the July 7, 2017 ozone exceedance is only the second wildfire exceptional event submitted within a 3-year period, the only mitigation requirements called for by the Exceptional Events Rule fall under 40 CFR §51.930(a). The Arizona Department of Environmental Quality issued a High Pollution Advisory (HPA) for July 7, 2017 warning of the possibility of elevated ozone concentrations (see Appendix A). The HPA serves to notify the public that high ozone concentrations are expected; provides for public education concerning actions that individuals may take to reduce exposure; and provides for the implementation of activities that can reduce ozone during an expected exceedance day.

The HPA advises that people most affected by ozone, including children, senior citizens, people who work or exercise outdoors, and people with pre-existing respiratory disease should limit their outdoor activities. Employers and travel reduction program coordinators are advised to activate their HPA plans immediately. The HPA also provides the public with ways to reduce ozone pollution during the expected exceedance day such as: carpooling, refueling after dark, and using low-VOC solvents and coatings. These notifications and suggested actions listed in the HPA meet the mitigation requirements of 40 CFR §51.930(a).

II. CONCEPTUAL MODEL

Description of the Maricopa 8-Hour Ozone Nonattainment Area

Nonattainment Area Boundaries

On May 21, 2012, the Environmental Protection Agency (EPA) published a final rule to designate the Maricopa nonattainment area as a Marginal Area for the 0.075 ppm eight-hour ozone standard. In the final rule, EPA expanded the existing nonattainment area boundary for the 1997 ozone standard slightly to the west and south to include new power plants. The eight-hour ozone nonattainment area is located in the Salt River Valley in the central portion of Arizona and encompasses 5,017 square miles. The northern boundary of the area is the Yavapai County line and the southern boundary is located generally along Hunt Highway, excluding the Gila River Indian Community, and approximately six miles north of Interstate 8, except for a portion that extends to Interstate 8 at the Town of Gila Bend. On the east, the area is bound by Gila County and Pinal County lines, except to include the City of Apache Junction; and on the west by approximately 355th, 403rd, and 499th Avenues. The area contains portions of the municipal planning areas for twenty-five cities and towns, and the Fort McDowell and Salt River Pima-Maricopa Indian Communities, as well as unincorporated areas under the jurisdiction of Maricopa County.

Geography and Climate Conditions

The elevation of the Phoenix metropolitan area is approximately 1,105 feet above mean sea level (MSL); however, the elevation in the nonattainment area ranges from approximately 600 feet above MSL near Gila Bend to 7,638 feet above MSL at Four Peaks in the Mazatzal Mountains in eastern Maricopa County. In addition to the Mazatzal Mountains, there are several mountain ranges throughout the nonattainment area. The Salt River Mountains are located on the southern border near the Gila River Indian Community and rise to an elevation of 2,507 feet above MSL. The Sierra Estrella Mountains located in the southwestern portion of the nonattainment area have an elevation of 3,320 feet above MSL. To the west, the White Tank Mountains rise to an elevation of 4,026 feet above MSL and the Phoenix Mountains have an elevation of 2,310 feet above MSL. Additional mountain ranges in the nonattainment area include the Hieroglyphic, McDowell, Maricopa, and Gila Bend Mountains.

There are six main rivers that run through the nonattainment area. These rivers are: Salt River, Agua Fria River, Gila River, New River, Verde River, and Hassayampa River. The climate in the nonattainment area is arid continental, experiencing extreme ranges in daily temperatures. Temperatures range from a mean of 55.4 degrees Fahrenheit in December to a mean of 94.8 degrees Fahrenheit in July; the annual mean temperature is 75.0 degrees Fahrenheit. The sun shines approximately 85 percent of the time and the annual average rainfall is 8.03 inches. Most of the rainfall occurs from December through March and during the months of July and August (NOAA, 2016).

In the Maricopa nonattainment area, there are several meteorological factors that influence elevated ozone concentrations throughout the summer ozone season. These factors include: early summer westerly transport of upwind air pollutants; a synoptic weather pattern featuring a high pressure over the northeastern portion of Arizona; a low pressure centered in the southwestern portion of Arizona; daytime local temperatures above 100 degrees Fahrenheit; and local emissions coinciding with valley-wide stagnant winds. The spatial distribution of elevated ozone concentrations in the region depends on surface

winds that exhibit diurnal valley breezes and directional changes due to surrounding topography. The average annual wind speed is 6.1 miles per hour.

Attainment Status and Regulatory Significance of Submitted Exceptional Event

On May 4, 2016, EPA published a final notice to determine that the Maricopa eight-hour ozone nonattainment area did not attain the 2008 standard and reclassified the area from Marginal to Moderate. The attainment date for Moderate Areas is July 20, 2018. A Moderate Area Plan for the area was due to EPA by January 1, 2017. On December 19, 2016, the Arizona Department of Environmental Quality officially submitted the *MAG 2017 Eight-Hour Ozone Moderate Area Plan for the Maricopa Nonattainment Area* to EPA. The plan demonstrated attainment of the 2008 ozone standard by July 20, 2018. EPA has yet to act on the plan submittal.

According to ozone monitoring data in the Maricopa nonattainment area from 2015-2017, the nonattainment area has attained the 2008 ozone standard with all monitors showing a 3-year average of the fourth high concentration of 0.075 ppm or less when ozone concentrations from two wildfire exceptional events on June 20, 2015 and July 7, 2017 are excluded. Both wildfire exceptional events need to be excluded by EPA in order for the Maricopa nonattainment area to show attainment by July 20, 2018, and avoid reclassification to a Serious nonattainment area. EPA has yet to act on the exceptional event submittal for the June 20, 2015 event. These facts establish that approval of the July 7, 2017 wildfire exceptional event is regulatory significant.

Typical Ozone Formation in the Maricopa Nonattainment Area

Overview

Ozone concentrations during the summer ozone season in the Maricopa eight-hour ozone nonattainment area are influenced by several factors including: westerly transport of upwind pollutants; a favorable synoptic weather pattern featuring high pressure over the northeastern portion of the state, a low pressure center in the southwest portion, and local emissions that are coincident with valley-wide stagnant and weak winds. The spatial distribution of high ozone concentrations depends on a diurnal valley breeze and directional change in winds induced by surrounding topography. Examination of the entire summer season shows the strong influence meteorological variability on ozone formation in the nonattainment area. As such, several meteorological regimes may result in an ozone exceedance. A map depicting the location of ozone monitors in the Maricopa eight-hour ozone nonattainment area is shown in Figure 2–1.

The Phoenix metropolitan area includes several major cities and is the core of the nonattainment area. Networks of freeways and arterial roads, and several significant point sources, exist in the urban core. The edges of the nonattainment area are considered suburban or rural and monitoring sites in these zones are typically in more remote or mountainous locations. Ozone can advect downwind of the urban core to surrounding rural and suburban sites and these regions can have different profiles than those in the urban core. The coupling of the urban and downwind sites depends greatly on how the daily weather conditions interact with local emissions.

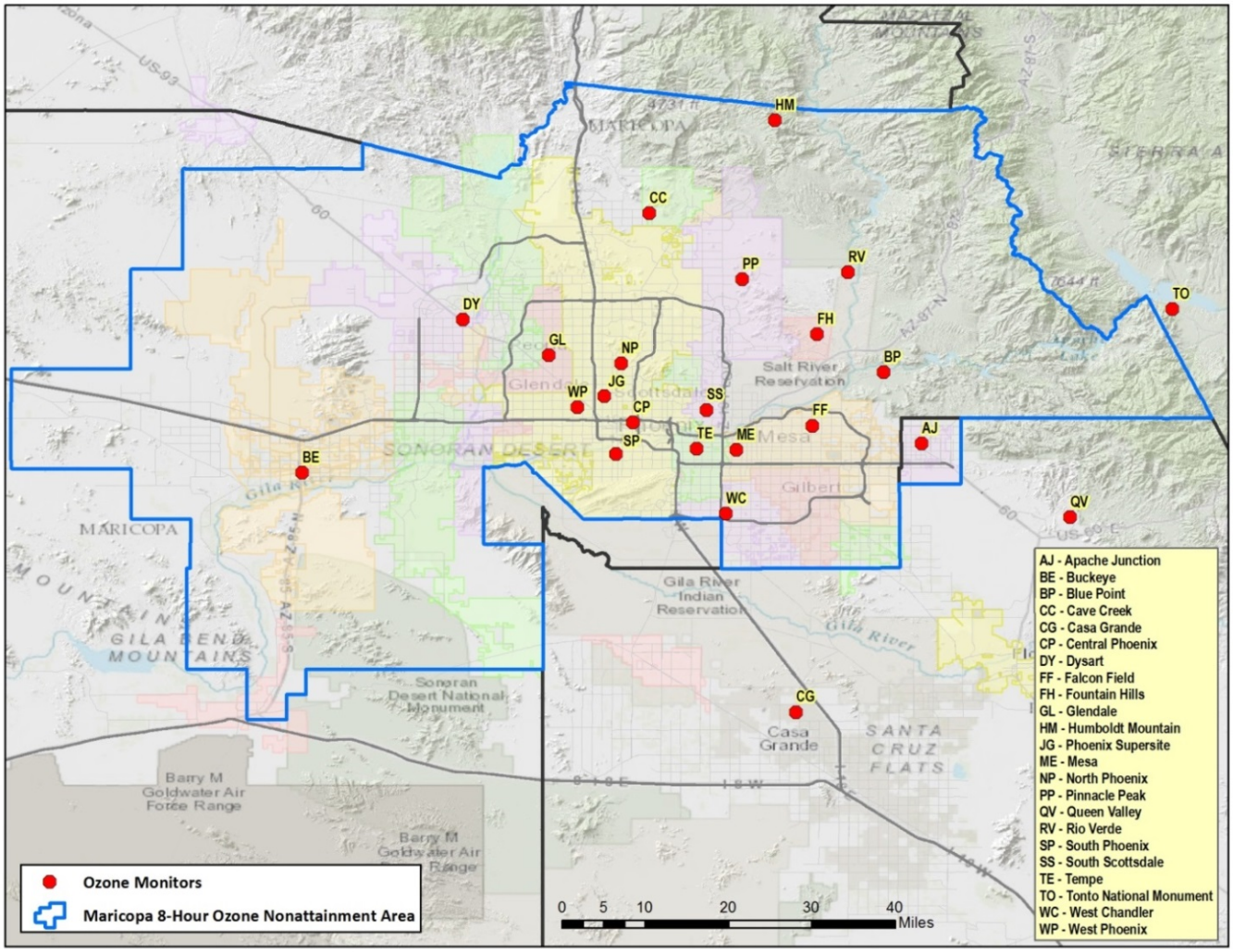


Figure 2-1. Maricopa eight-hour nonattainment area and ozone monitoring stations (monitors on tribal lands not pictured).

Transported ozone (international, interstate, stratospheric) can also influence local ozone levels, especially in the late spring and early summer when the transport pathways are conducive to elevated ozone. The nonattainment area is often downwind from source regions in Southern California and Northern Mexico. It is also aligned with the Rocky Mountains where early summer stratospheric ozone intrusions have been documented. Cold front storm systems associated with a southerly deviation of the late spring jet stream are conducive to these types of long range and vertical transport.

Under more localized conditions, most elevated ozone episodes occur under a distinct mesoscale meteorological pattern with a pronounced valley breeze or general stagnation. Many of the urban ozone monitors in the area are located within a basin surrounded by mountain ranges, and differential solar heating of surrounding topography often creates a thermal circulation known as the valley breeze. Under weak large scale summer weather patterns, local winds flow calmly to the southwest late at night and into morning and then strengthen towards the northeast in the afternoon hours. Although a variety of large scale weather patterns occur in the desert southwest, favorable patterns for elevated ozone often recur throughout the summer. These patterns create high temperatures, upper level winds from the south and/or west, sinking air from higher altitudes, and a sustained valley breeze circulation at the surface.

Each monitoring site within the nonattainment area exhibits a diurnal pattern in ozone levels, but the timing and magnitude depend on locations. Urban sites exhibit a more pronounced diurnal cycle in ozone, with the maximum occurring in late afternoon before sunset and the minimum just prior to sunrise. Ozone can be consumed by titration from locally generated NO_x in the urban core and also removed by dry deposition during night. In contrast, maximum ozone concentrations have been measured hours later at downwind rural sites. Most anthropogenic precursors are emitted from the urban core and follow a diurnal pattern related to traffic patterns that peak twice daily with the morning and evening rush hours. Anthropogenic emissions also vary by day of week, with most sources exhibiting lower emissions on the weekends due to fewer industrial, commercial and traffic activities. Naturally occurring VOC levels vary over the course of the ozone season, and biogenic emissions highly depend on meteorology (i.e. sunlight, temperature, and relative humidity).

Ozone Season Monthly Variations

Ozone concentrations vary by month in the ozone season, with historical exceedances of the 2008 ozone standard recorded in the months of April through September. Table 2–1 provides a month-by-month analysis of the number of ozone exceedance days (days with at least one exceeding monitor, relative to the 2008 ozone standard) per month in the Maricopa nonattainment area for the years 2005-2017. Historically, a small percentage of exceedance days occurred in April and September, while more than 90% of the exceedance days occurred in May through August.

Table 2-1. Ozone Exceedance Days (2008 Standard) by Month in the Maricopa Eight-Hour Ozone Nonattainment Area.

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total by Month
April	4	0	0	2	1	0	0	2	0	0	0	0	1	10
May	8	7	5	2	1	2	2	10	3	1	0	0	0	41
June	12	17	4	8	1	5	9	3	3	4	5	2	5	78
July	12	12	5	7	1	0	2	3	4	3	0	3	3	55
August	4	6	6	3	0	0	4	10	2	0	2	1	5	43
September	1	0	1	0	0	3	1	0	1	3	0	0	2	12
Total by Year	***41***	***42***	***21***	***22***	***4***	***10***	***18***	***28***	***13***	***11***	***7***	***6***	***16***	***239***

On average, May has relatively lower temperatures, less sunlight and stronger ventilating westerly winds, all of which typically limit ozone production. But during this time transport from Southern California and Mexico can be enhanced by cold fronts and stratospheric intrusions from late-spring low pressure systems. Cold fronts and associated westerly transport can recur several times before the monsoonal high pressure system begins to dominate in the region.

June is usually much warmer than May. Early in the month the air is dry prior to development of the southwestern monsoon pattern. Afternoons can be extremely hot ($T > 110$ °F) and dry ($RH < 10\%$), and have the longest exposure to sunlight near the summer solstice. The majority of exceedance days have occurred historically in the month of June when local meteorological conditions (e.g., weak or stagnant winds) favor ozone production. By the end of the month, the monsoonal high pressure pattern begins to dominate.

July and August have extremely high daytime temperatures and are influenced much more by the regional monsoon pattern. A large scale upper level high pressure feature usually aligns over the Four Corners

area and pumps moist, unstable air from the southeast. While the synoptic pattern can persist for several weeks, sudden changes in mesoscale weather during this time make ozone formation more complicated. Under monsoonal steering winds, small scale thunderstorms thrive under these favorable dynamics. Days are typically more humid and can exhibit short lived severe weather (intense rain, strong winds and windblown dust). The high pressure often controls the local flow in between thunderstorm events. Stagnant winds can last long enough to trap pollutants and create the highest ozone of the season. Additionally, peak biogenic VOC emissions occur in August that may enhance ozone formation.

Wildfire Description

During July 1-7, 2017, multiple wildfires were actively burning in the southeastern portion of Arizona. These wildfires varied in size from 166 to 48,443 acres. The three main wildfires that produced the most emissions of ozone precursors during this period are the Burro, Frye and Hilltop fires, which resulted in 27,238; 48,443; and 33,826 total acres burned, respectively. Ozone and ozone precursor emissions from these fires accumulated in southeastern Arizona and then were transported into the Maricopa nonattainment area on July 7, 2017.

The causes of the wildfires are a mixture of lightning strikes, human activity and unknown sources. Information on each fire can be obtained through Inciweb (https://inciweb.nwcg.gov/state/3/) or the Arizona Department of Forestry and Fire Management (https://dffm.az.gov/). Figure 2–2 maps the location of these active wildfires and Table 2–2 contains a detailed list of the actively burning wildfires that contributed to the exceedances of the 2008 ozone standard in the Maricopa nonattainment area on July 7, 2017.

On July 6 and 7, 2017, Pima County (southeast of the nonattainment area) issued air quality advisories due to the potential for elevated levels of particulate matter from the Burro wildfire (https://ein.az.gov/emergency-information/emergency-bulletin/air-quality-advisory-particulates-burro-fire-smoke and https://ein.az.gov/emergency-information/emergency-bulletin/pima-county-issues-air-quality-advisory-particulates-and). The Pima County notice on July 7, 2017 references the National Weather Service which predicted a chance that winds would bring fire smoke north, up and through Marana. This trajectory would also carry the smoke directly into the Maricopa nonattainment area from the southeast. Pinal County also issued a similar air quality advisory for wildfire smoke on July 7, 2017 (https://ein.az.gov/emergency-information/emergency-bulletin/pinal-county-issues-air-quality-advisory-tri-community-area).

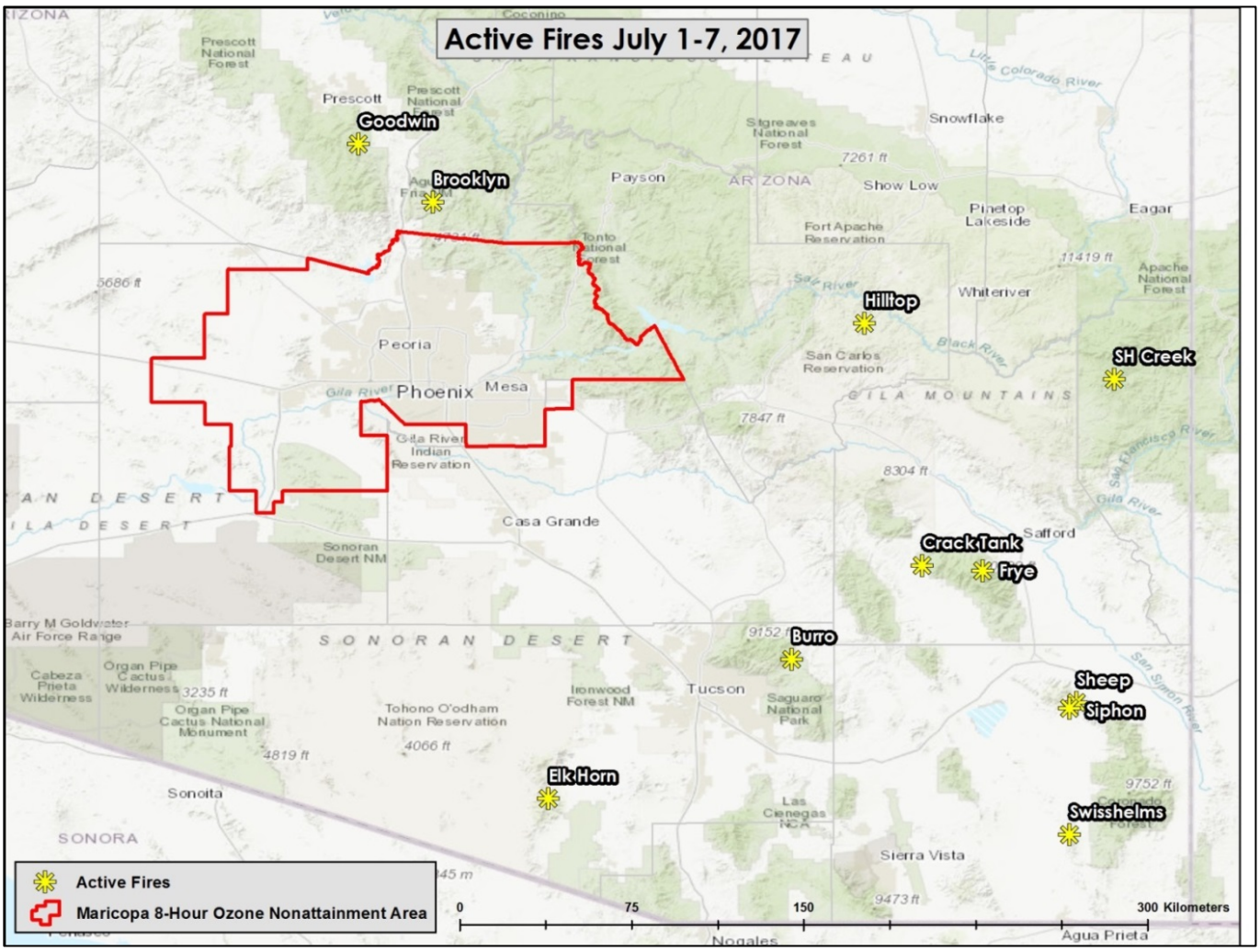


Figure 2-2. Active wildfires on July 1-7, 2017 in southeastern Arizona.

Table 2-2. List of Actively Burning Wildfires in Southeastern Arizona from July 1-7, 2017.

Wildfire	Lat	Long	Start Date	100% Contain Date	Total Acres Burned	Reported Fire Perimeter (Acres)						
						7/1/17	7/2/17	7/3/17	7/4/17	7/5/17	7/6/17	7/7/17
Brooklyn	34.148	-111.963	7/7/17	7/12/17	33,550							600
Burro	32.375	-110.633	6/30/17	7/19/17	27,238	3,573	11,321	19,089	23,274	25,090	26,089	26,659
Crack Tank	32.737	-110.104	7/7/17	7/8/17	166							70
Elk Horn	31.818	-111.439	7/4/17	7/10/17	650			5	216	550	650	650
Frye	32.735	-109.872	6/7/17	7/30/17	48,443	42,755	45,154	46,074	46,760	47,048	47,688	47,688
Goodwin	34.358	-112.373	6/24/17	7/10/17	28,516	25,714	27,541	28,508	28,516	28,516	28,516	28,516
Hilltop	33.634	-110.375	6/25/17	7/25/17	33,826	8,644	15,869	17,639	17,639	23,519	25,657	28,077
SH Creek	33.468	-109.342	6/27/17	7/25/17	3,048						2,723	2,723
Sheep	32.214	-109.484	7/3/17	7/13/17	4,617						2,800	3,900
Siphon	32.179	-109.532	7/4/17	7/8/17	270				270	270	270	270
Swisshelms	31.681	-109.524	6/27/17	7/8/17	10,950	9,701	9,701	10,950	10,950	10,950	10,950	10,950

Note: Wildfires during this period with a total acreage burned of less than 5 acres are not included.

Ozone Formation in the Maricopa Nonattainment Area due to the Wildfire Event

During the period of July 1-7, 2017, wildfires burning primarily in the southeastern portion of Arizona produced smoke, ozone and ozone precursor emissions. These emissions accumulated over time in southeastern Arizona, as airflow patterns on July 1-5, 2017 largely confined these emissions to southeastern Arizona. On July 6, 2017, airflow patterns began to shift from coming out of the southwest to coming out of the southeast. As this airflow shift occurred, the smoke, ozone and ozone precursor emissions from the wildfires were transported into the Maricopa nonattainment area during the evening of July 6, 2017 and throughout the day of July 7, 2017. The increased levels of ozone and ozone precursor emissions from the wildfires resulted in enhanced ozone production across the Maricopa nonattainment area, causing nine monitoring sites to exceed the 2008 ozone standard of 0.075 ppm on July 7, 2017.

The following subsections provide (1) descriptions of the meteorological conditions that existed in the Maricopa nonattainment area during this period; (2) summary maps from NOAA showing active wildfire locations, estimated smoke outputs, and 24-hour back trajectories in relation to the Maricopa nonattainment area; and (3) ozone concentrations in the Maricopa nonattainment area. Detailed evidence on the clear causal relationship between the wildfires and the ozone exceedances is discussed in Section III, including satellite photos of smoke production, visibility reductions in the Maricopa nonattainment area, spatial patterns of ozone concentrations, and analysis of the altered diurnal concentrations of ozone, NOx, CO, and $PM_{2.5}$ as a result of the wildfire emissions. Analysis of similar meteorological days in July when ozone exceedances did and did not occur in the Maricopa nonattainment area provide additional evidence that the exceedances on July 7, 2017 were unique and would normally not have occurred but for the presence of the additional ozone and ozone precursor emissions from the wildfires.

Meteorological Data

To provide a sense of the overall weather patterns affecting the Maricopa nonattainment area, Figures 2–3 through 2–5 display the synoptic scale weather patterns present on the days before, during, and after July 7, 2017 (July 6-8, 2017). These figures reveal a high pressure ridge in place on July 6 known as a "Four Corners High", which steadily weakens on July 7th and 8th, shifting winds from out of the southwest to out of the southeast. As the high weakens, an increase in monsoon-pattern activity occurs on July 7 and through July 8, which also promotes the vertical mixing of air aloft to the ground level.

Figure 2–6 contains the daily climatological data from the Sky Harbor airport for the month of July 2017. The figure reveals the switch in resultant wind speed that occurs on July 7 allowing for airflow from the wildfire areas to enter the nonattainment area. An afternoon thunderstorm in the vicinity of Sky Harbor International Airport is also noted. July 7 was the hottest day of the month (118°F), breaking the previous record for that day. While it may be tempting to assume the increased heat contributed to the exceedances on July 7, 2017, Figure 2–7 shows that there is no historical correlation between high temperatures and daily maximum 8-hour ozone concentrations in the month of July during the last five years (2013-2017) within the Maricopa nonattainment area. While the heat did not cause the exceedances, the increased heat did contribute to increased vertical mixing, which likely allowed more of the ozone and ozone precursor emissions aloft the chance to impact the exceeding monitors at the ground level.

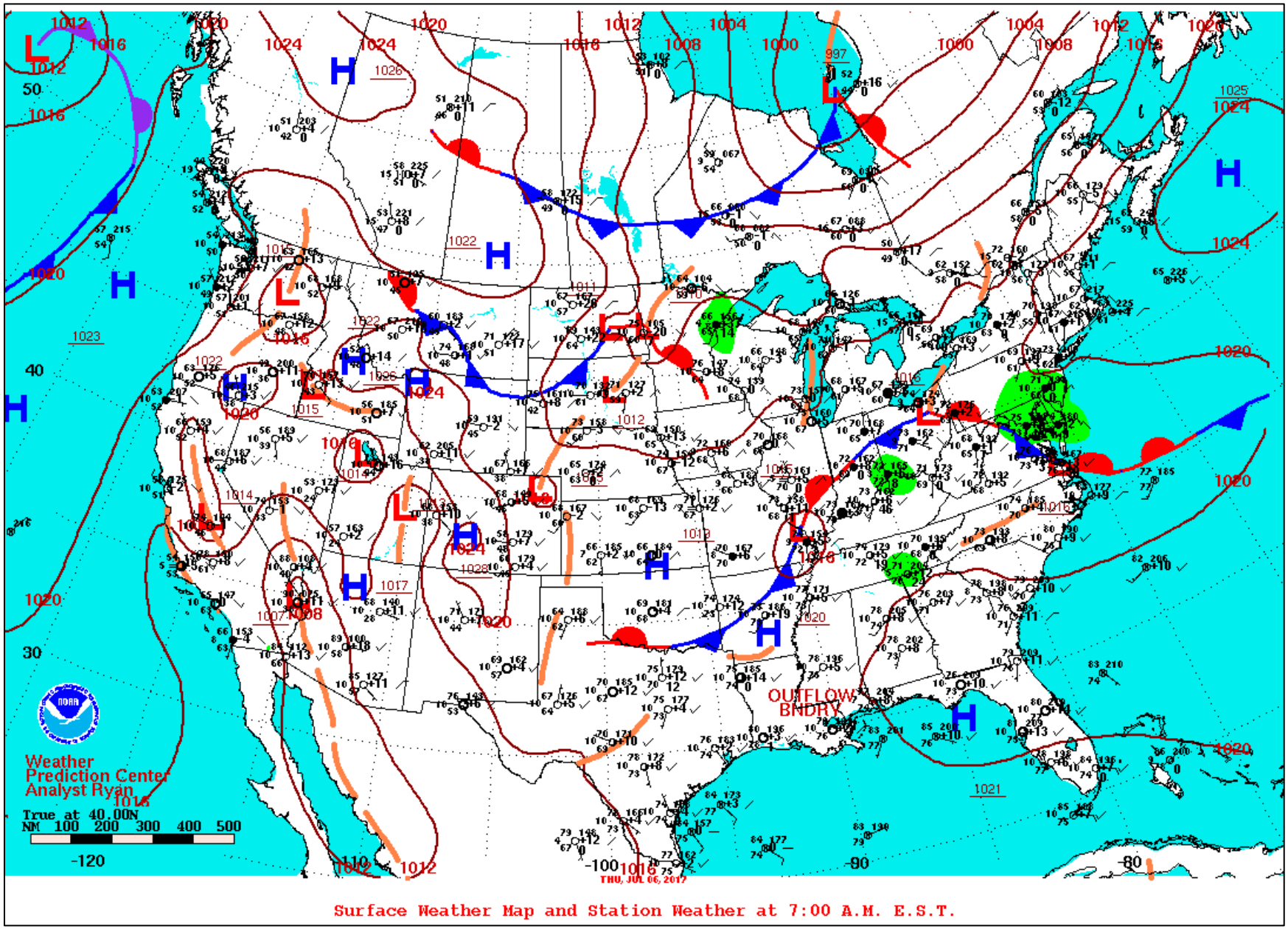


Figure 2-3. Synoptic weather on July 6, 2017.

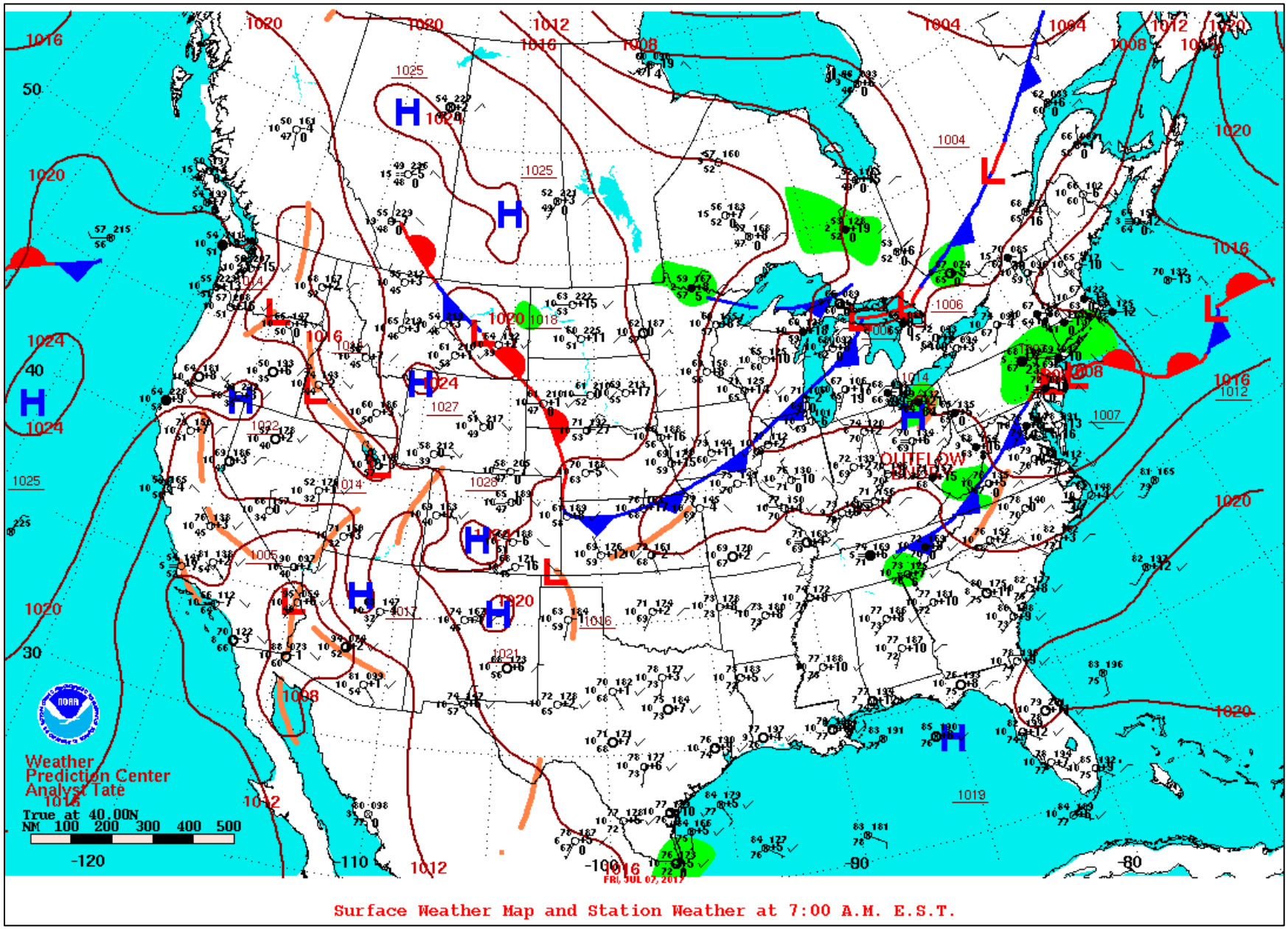


Figure 2-4. Synoptic weather on July 7, 2017.

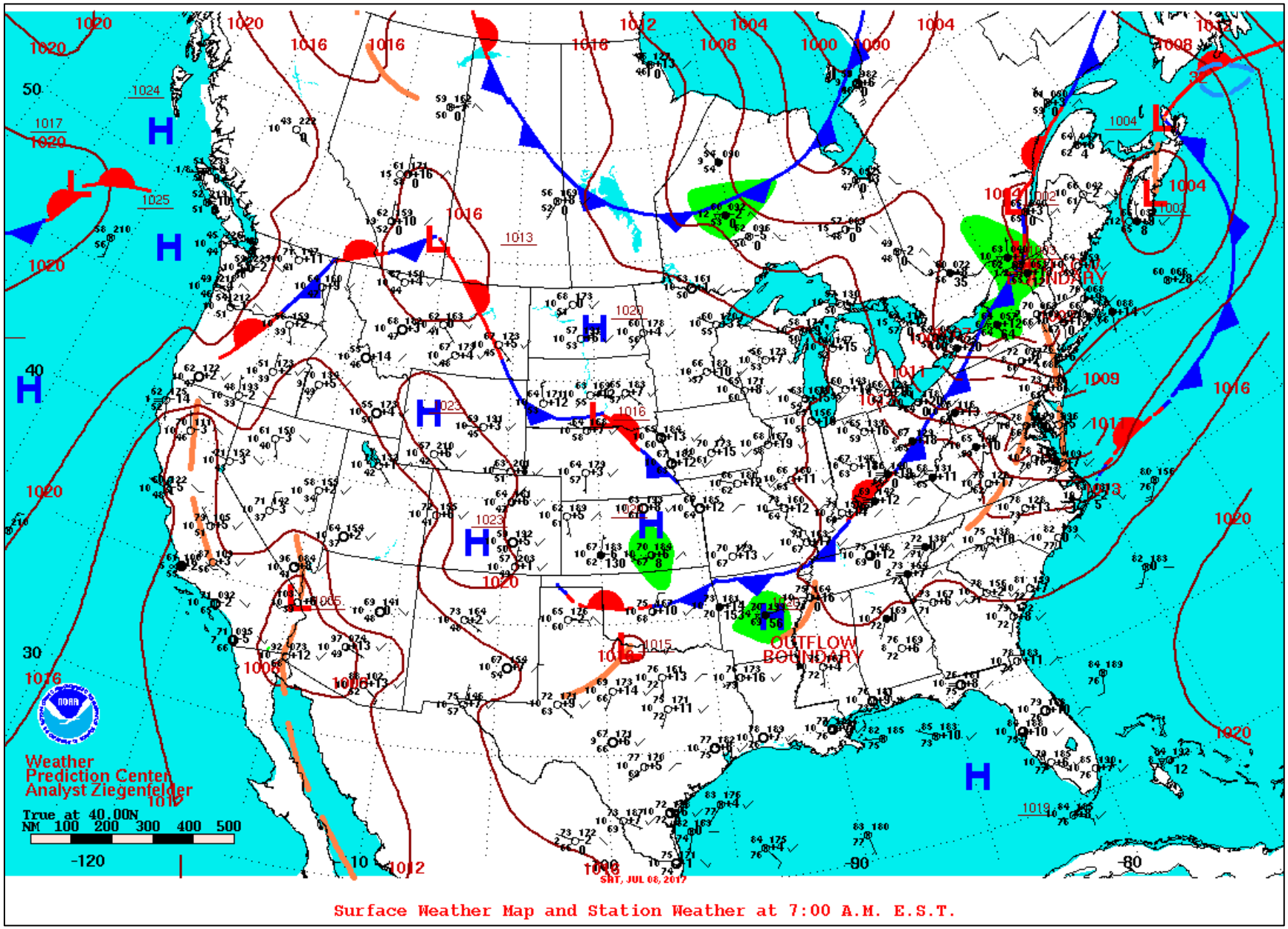
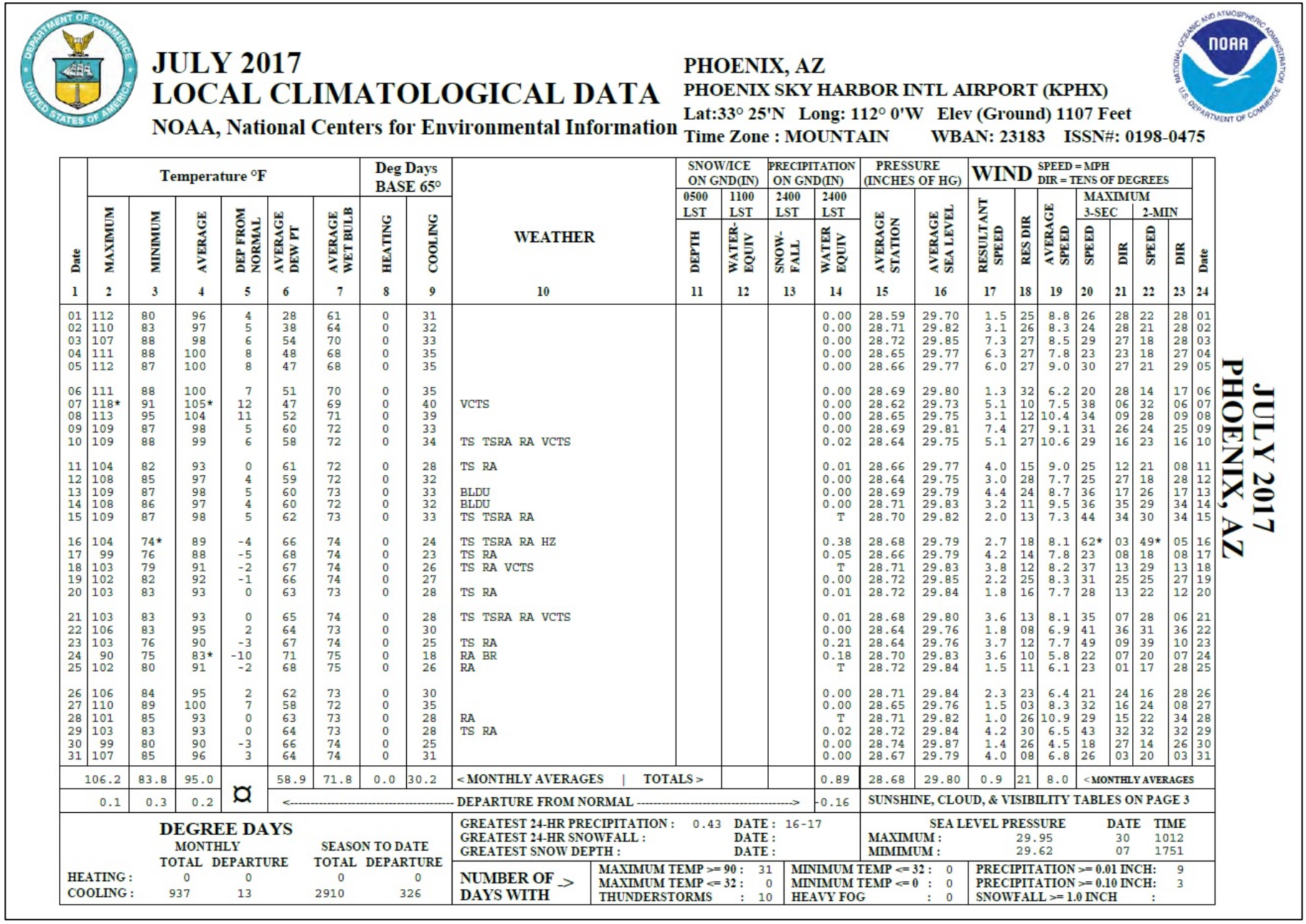


Figure 2-5. Synoptic weather on July 8, 2017.



JULY 2017
LOCAL CLIMATOLOGICAL DATA
NOAA, National Centers for Environmental Information

PHOENIX, AZ
PHOENIX SKY HARBOR INTL AIRPORT (KPHX)
Lat:33° 25'N Long: 112° 0'W Elev (Ground) 1107 Feet
Time Zone : MOUNTAIN WBAN: 23183 ISSN#: 0198-0475

JULY 2017
PHOENIX, AZ

Date	Temperature °F						Deg Days BASE 65°		WEATHER	SNOW/ICE ON GND(IN)		PRECIPITATION ON GND(IN)		PRESSURE (INCHES OF HG)		WIND SPEED = MPH DIR = TENS OF DEGREES			MAXIMUM				Date
										0500 LST	1100 LST	2400 LST	2400 LST						3-SEC		2-MIN		
	MAXIMUM	MINIMUM	AVERAGE	DEP FROM NORMAL	AVERAGE DEW PT	AVERAGE WET BULB	HEATING	COOLING		DEPTH	WATER-EQUIV	SNOW-FALL	WATER EQUIV	AVERAGE STATION	AVERAGE SEA LEVEL	RESULTANT SPEED	RES DIR	AVERAGE SPEED	SPEED	DIR	SPEED	DIR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	112	80	96	4	28	61	0	31					0.00	28.59	29.70	1.5	25	8.8	26	28	22	28	01
02	110	83	97	5	38	64	0	32					0.00	28.71	29.82	3.1	26	8.3	24	28	21	28	02
03	107	88	98	6	54	70	0	33					0.00	28.72	29.85	7.3	27	8.5	29	27	18	28	03
04	111	88	100	8	48	68	0	35					0.00	28.65	29.77	6.3	27	7.8	23	23	18	27	04
05	112	87	100	8	47	68	0	35					0.00	28.66	29.77	6.0	27	9.0	30	27	21	29	05
06	111	88	100	7	51	70	0	35					0.00	28.69	29.80	1.3	32	6.2	20	28	14	17	06
07	118*	91	105*	12	47	69	0	40	VCTS				0.00	28.62	29.73	5.1	10	7.5	38	06	32	06	07
08	113	95	104	11	52	71	0	39					0.00	28.65	29.75	3.1	12	10.4	34	09	28	09	08
09	109	87	98	5	60	72	0	33					0.00	28.69	29.81	7.4	27	9.1	31	26	24	25	09
10	109	88	99	6	58	72	0	34	TS TSRA RA VCTS				0.02	28.64	29.75	5.1	27	10.6	29	16	23	16	10
11	104	82	93	0	61	72	0	28	TS RA				0.01	28.66	29.77	4.0	15	9.0	25	12	21	08	11
12	108	85	97	4	59	72	0	32					0.00	28.64	29.75	3.0	28	7.7	25	27	18	28	12
13	109	87	98	5	60	73	0	33	BLDU				0.00	28.69	29.79	4.4	24	8.7	36	17	26	17	13
14	108	86	97	4	60	72	0	32	BLDU				0.00	28.71	29.83	3.2	11	9.5	36	35	29	34	14
15	109	87	98	5	62	73	0	33	TS TSRA RA				T	28.70	29.82	2.0	13	7.3	44	34	30	34	15
16	104	74*	89	-4	66	74	0	24	TS TSRA RA HZ				0.38	28.68	29.79	2.7	18	8.1	62*	03	49*	05	16
17	99	76	88	-5	68	74	0	23	TS RA				0.05	28.66	29.79	4.2	14	7.8	23	08	18	08	17
18	103	79	91	-2	67	74	0	26	TS RA VCTS				T	28.71	29.83	3.8	12	8.2	37	13	29	13	18
19	102	82	92	-1	66	74	0	27					0.00	28.72	29.85	2.2	25	8.3	31	25	25	27	19
20	103	83	93	0	63	73	0	28	TS RA				0.01	28.72	29.84	1.8	16	7.7	28	13	22	12	20
21	103	83	93	0	65	74	0	28	TS TSRA RA VCTS				0.01	28.68	29.80	3.6	13	8.1	35	07	28	06	21
22	106	83	95	2	64	73	0	30					0.00	28.64	29.76	1.8	08	6.9	41	36	31	36	22
23	103	76	90	-3	67	74	0	25	TS RA				0.21	28.64	29.76	3.7	12	7.7	49	09	39	10	23
24	90	75	83*	-10	71	75	0	18	RA BR				0.18	28.70	29.83	3.6	10	5.8	22	07	20	07	24
25	102	80	91	-2	68	75	0	26	RA				T	28.72	29.84	1.5	11	6.1	23	01	17	28	25
26	106	84	95	2	62	73	0	30					0.00	28.71	29.84	2.3	23	6.4	21	24	16	28	26
27	110	89	100	7	58	72	0	35					0.00	28.65	29.76	1.5	03	8.3	32	16	24	08	27
28	101	85	93	0	63	73	0	28	RA				T	28.71	29.82	1.0	26	10.9	29	15	22	34	28
29	103	83	93	0	64	73	0	28	TS RA				0.02	28.72	29.84	4.2	30	6.5	43	32	32	32	29
30	99	80	90	-3	66	74	0	25					0.00	28.74	29.87	1.4	26	4.5	18	27	14	26	30
31	107	85	96	3	64	74	0	31					0.00	28.67	29.79	4.0	08	6.8	26	03	20	03	31
	106.2	83.8	95.0	¤	58.9	71.8	0.0	30.2	< MONTHLY AVERAGES | TOTALS >				0.89	28.68	29.80	0.9	21	8.0	< MONTHLY AVERAGES				
	0.1	0.3	0.2		<---------- DEPARTURE FROM NORMAL ---------->								-0.16	SUNSHINE, CLOUD, & VISIBILITY TABLES ON PAGE 3										

DEGREE DAYS

	MONTHLY TOTAL	MONTHLY DEPARTURE	SEASON TO DATE TOTAL	SEASON TO DATE DEPARTURE
HEATING :	0	0	0	0
COOLING :	937	13	2910	326

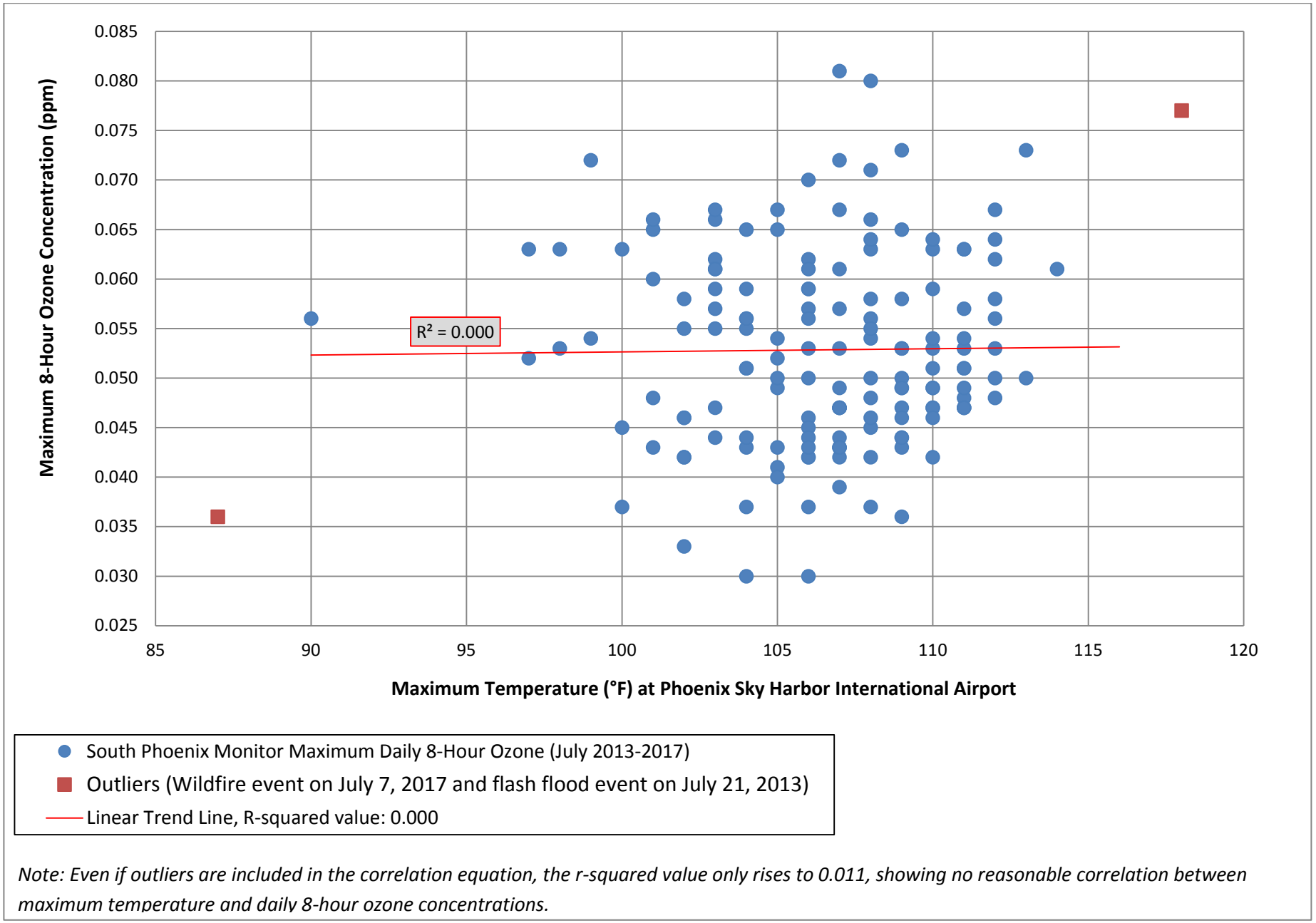
GREATEST 24-HR PRECIPITATION : 0.43 DATE : 16-17
GREATEST 24-HR SNOWFALL : DATE :
GREATEST SNOW DEPTH : DATE :

SEA LEVEL PRESSURE		DATE	TIME
MAXIMUM :	29.95	30	1012
MIMIMUM :	29.62	07	1751

NUMBER OF DAYS WITH ->

MAXIMUM TEMP >= 90 : 31	MINIMUM TEMP <= 32 : 0	PRECIPITATION >= 0.01 INCH: 9
MAXIMUM TEMP <= 32 : 0	MINIMUM TEMP <= 0 : 0	PRECIPITATION >= 0.10 INCH: 3
THUNDERSTORMS : 10	HEAVY FOG : 0	SNOWFALL >= 1.0 INCH :

Figure 2-6. July 2017 local climatological data.



Note: Even if outliers are included in the correlation equation, the r-squared value only rises to 0.011, showing no reasonable correlation between maximum temperature and daily 8-hour ozone concentrations.

Figure 2-7. Lack of correlation between maximum temperature and maximum daily 8-hour ozone concentrations.

NOAA Smoke Maps

The National Oceanic and Atmospheric Administration (NOAA) produce maps that include satellite detection of wildfires and estimates of smoke impacts from those wildfire sources. In Figures 2–8 through 2–17, the wildfires and their smoke impacts are mapped in Google Earth to show their location relative to the Maricopa nonattainment area on July 1-10, 2017. Ozone monitors in Arizona are indicated with yellow dots on the maps, and 24-hour HYSPLIT back trajectories at 100 and 1500 meters originating from the center of the nonattainment area (Phoenix Supersite monitor, ending at 4:00 pm local time) are indicated in red and blue lines, respectively. These figures show the greatest smoke impacts in the nonattainment area on July 7, 2017, (when exceedances occur) and also show the shift in back trajectories that occur on July 7, 2017, allowing smoke from the wildfires to transport to the nonattainment area monitors.

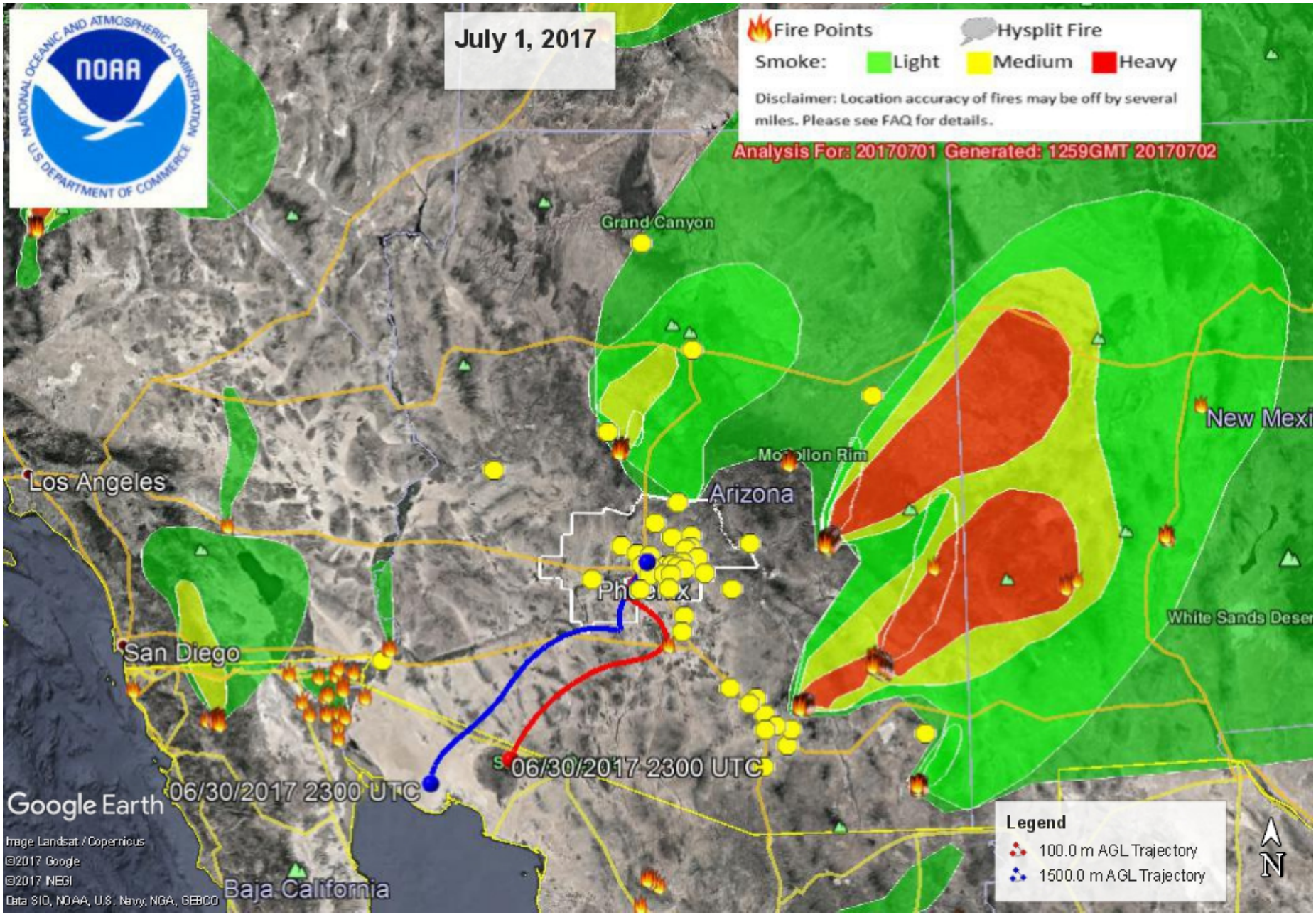


Figure 2-8. NOAA smoke map for July 1, 2017.

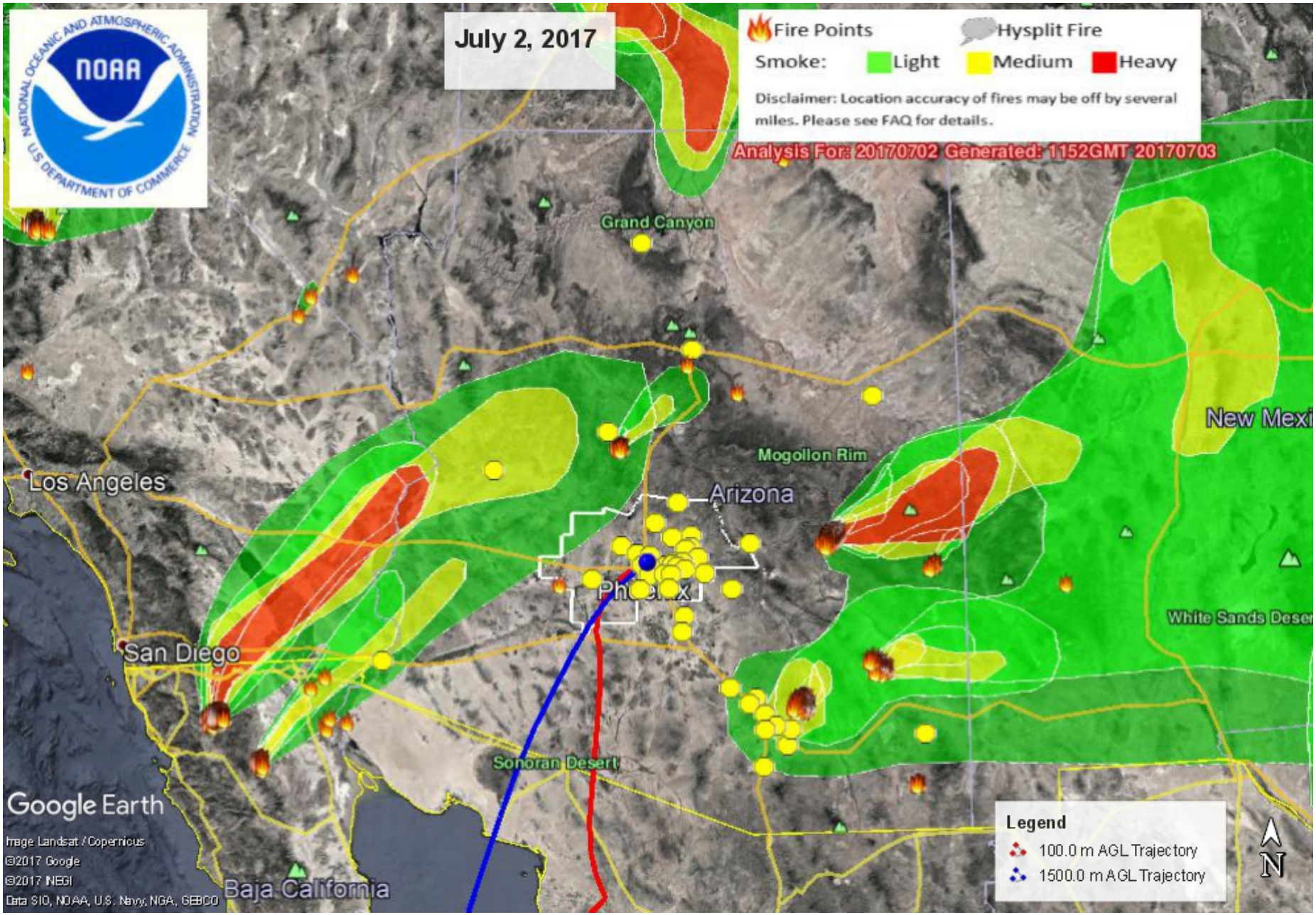


Figure 2-9. NOAA smoke map for July 2, 2017.

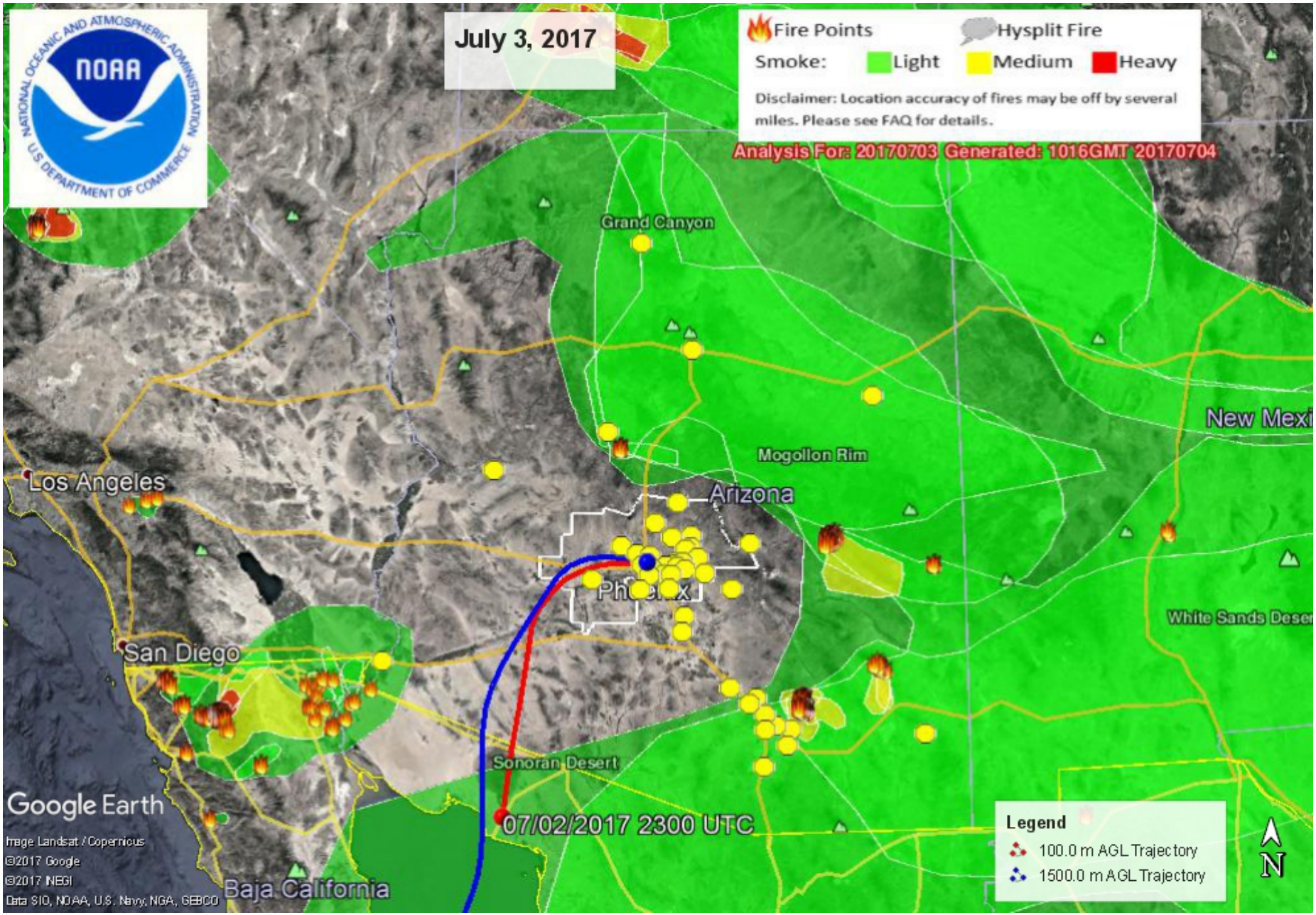


Figure 2-10. NOAA smoke map for July 3, 2017.

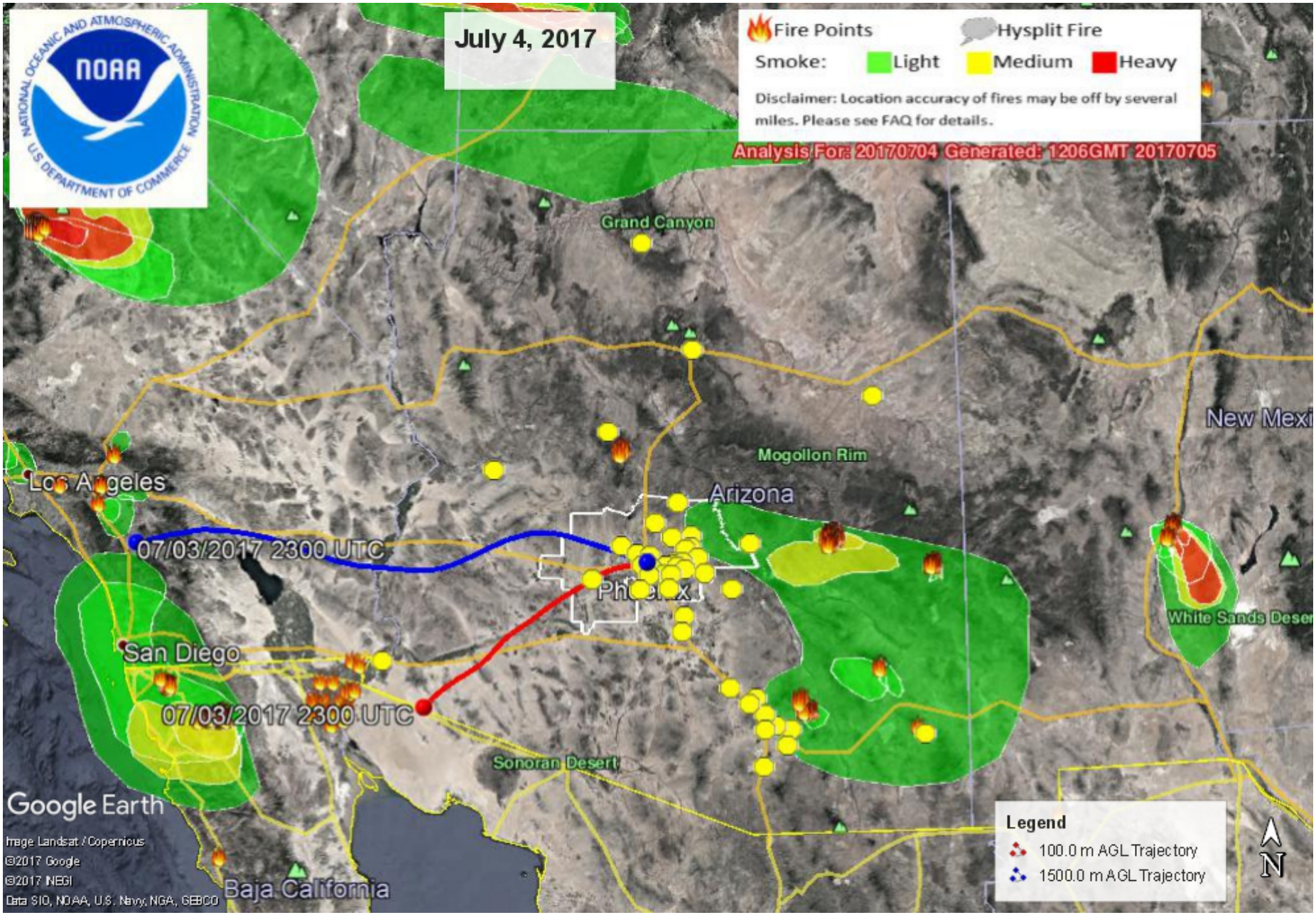


Figure 2-11. NOAA smoke map for July 4, 2017.

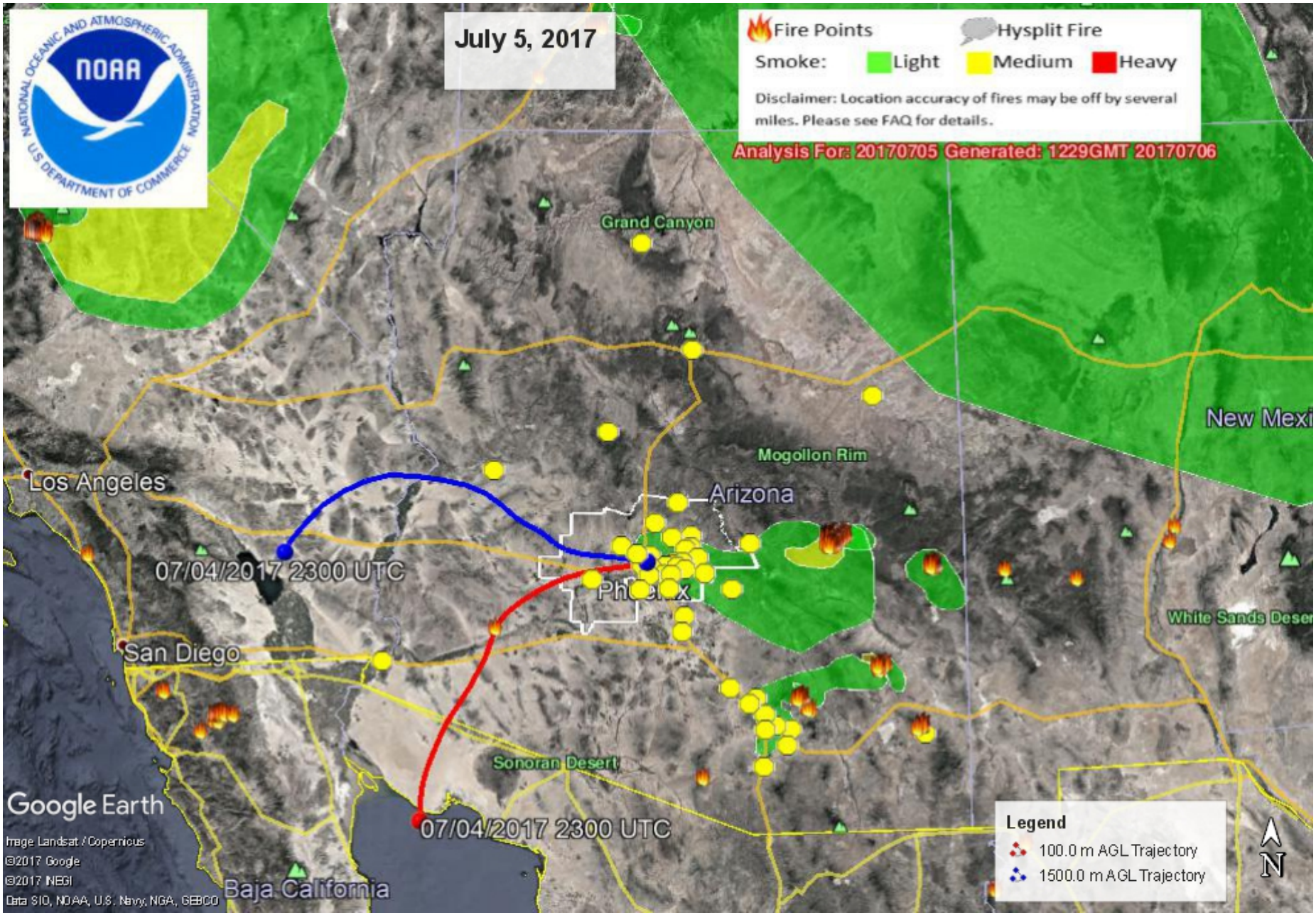


Figure 2-12. NOAA smoke map for July 5, 2017.

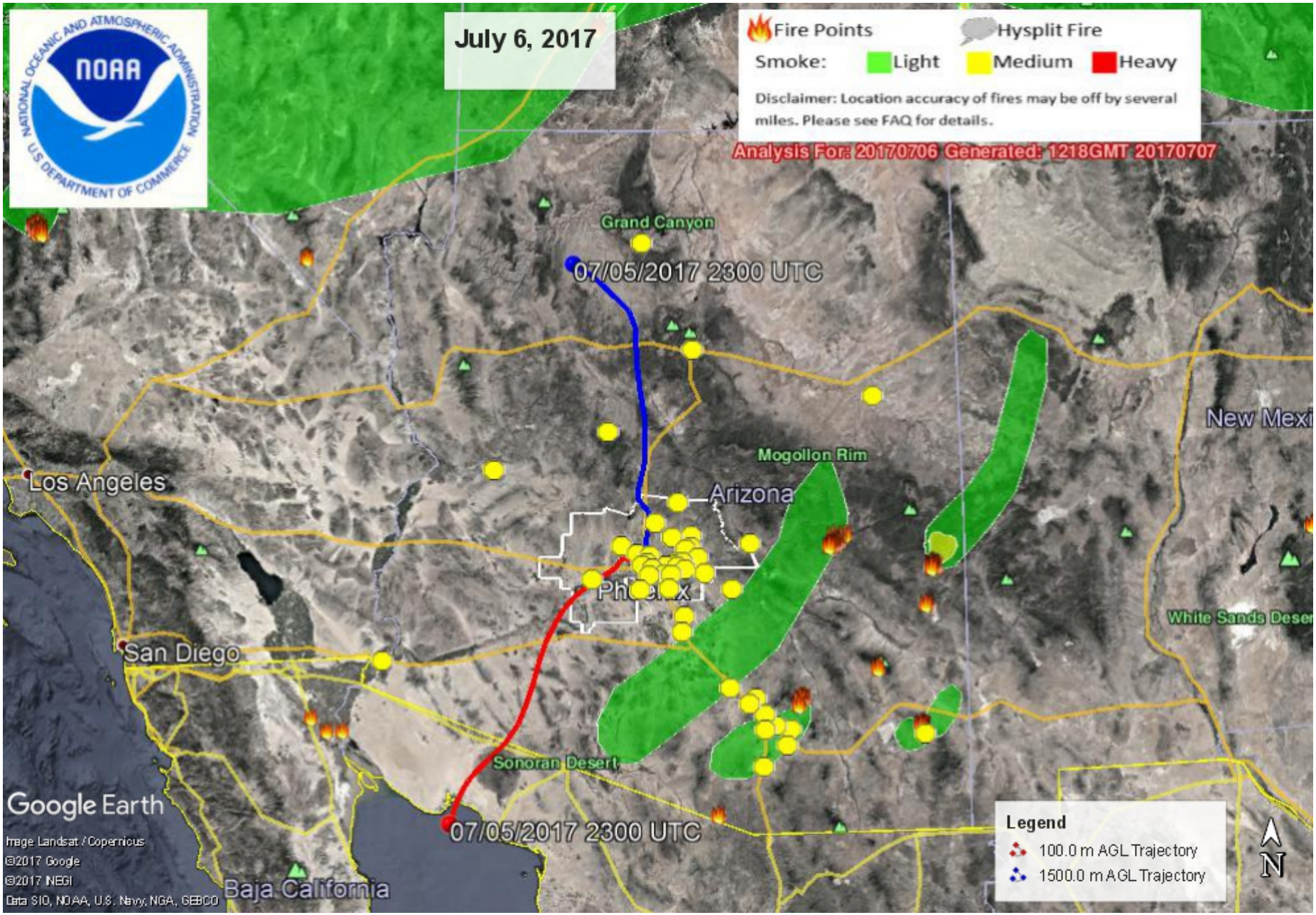


Figure 2-13. NOAA smoke map for July 6, 2017.

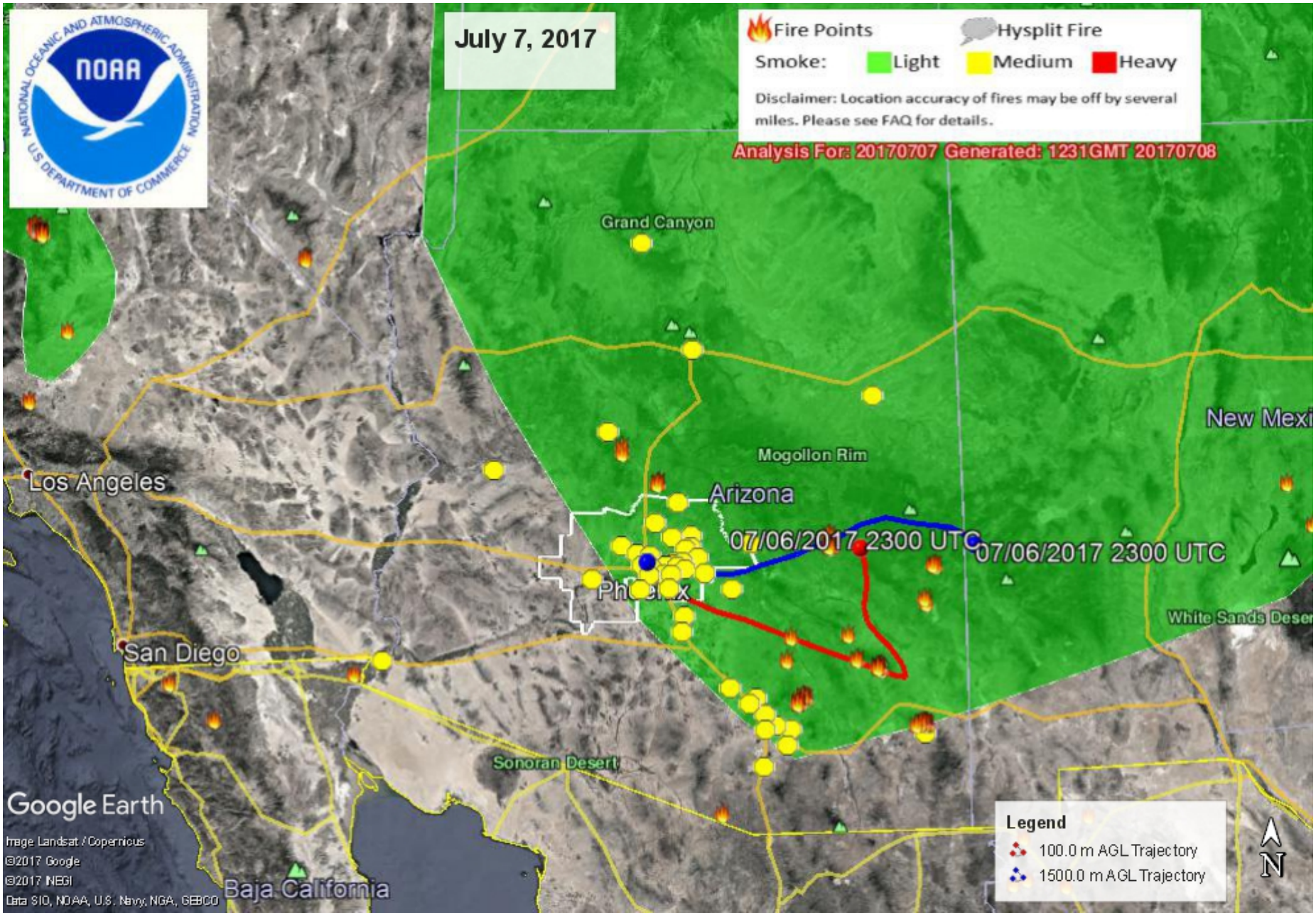


Figure 2-14. NOAA smoke map for July 7, 2017.

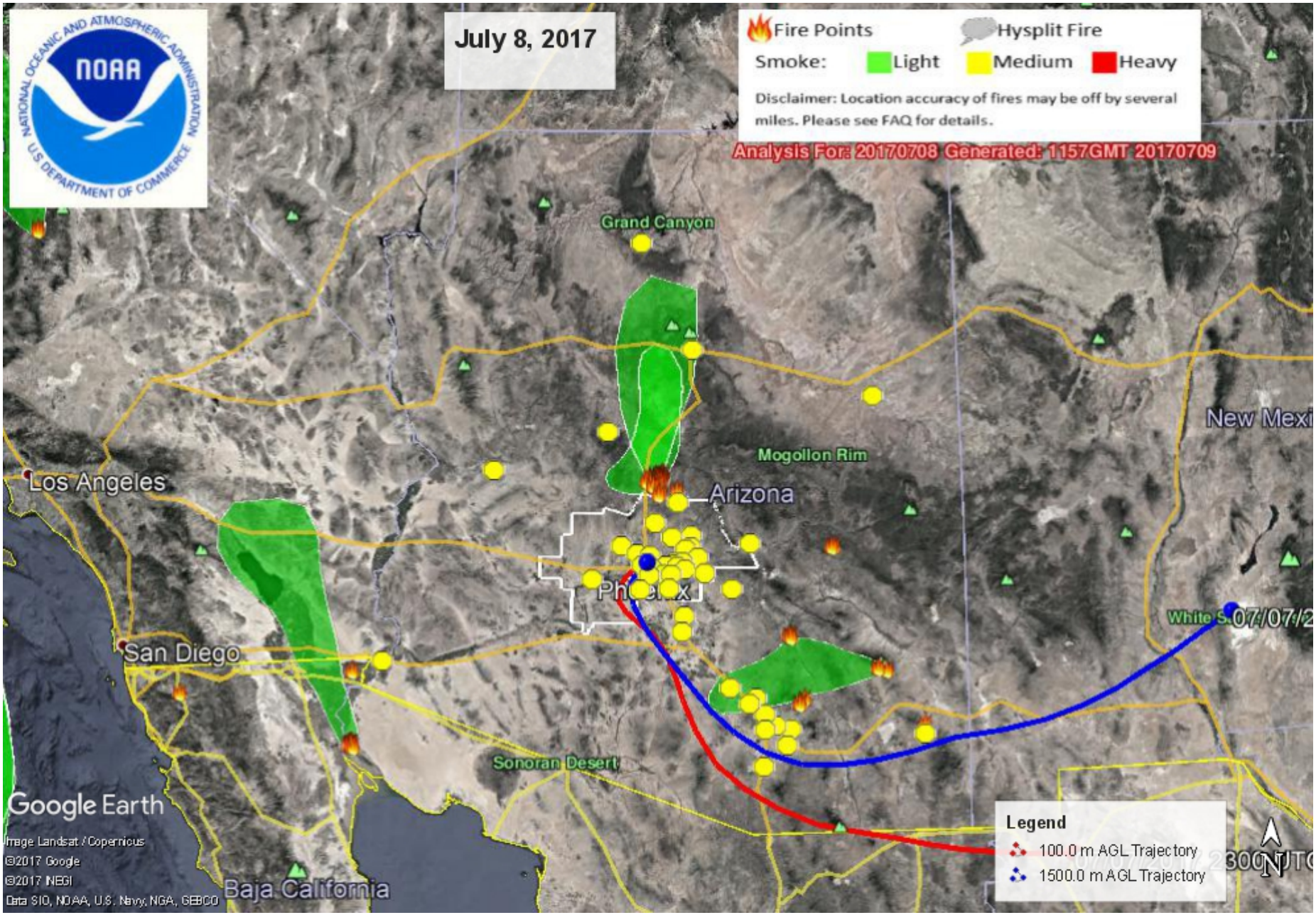


Figure 2-15. NOAA smoke map for July 8, 2017.

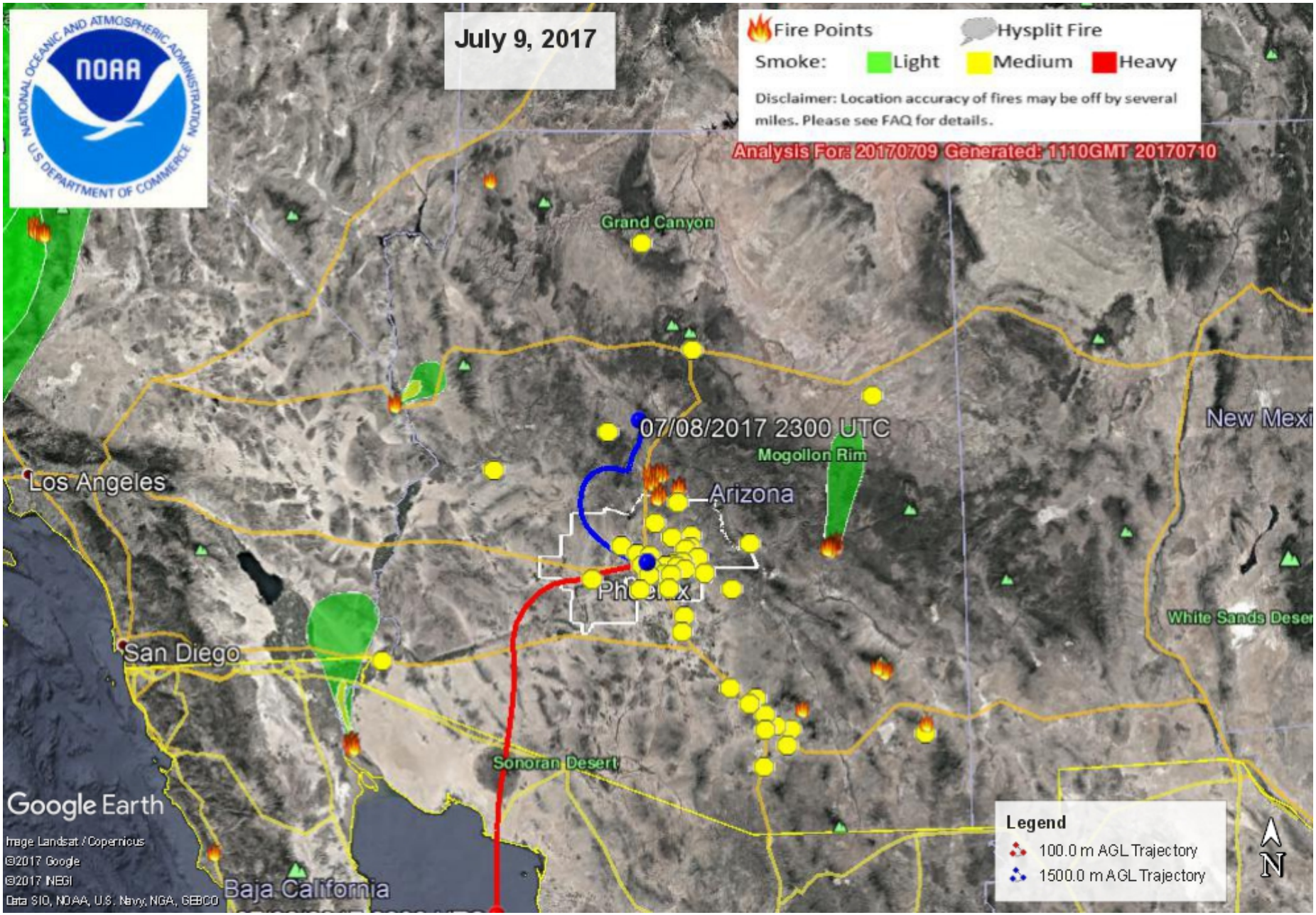


Figure 2-16. NOAA smoke map for July 9, 2017.

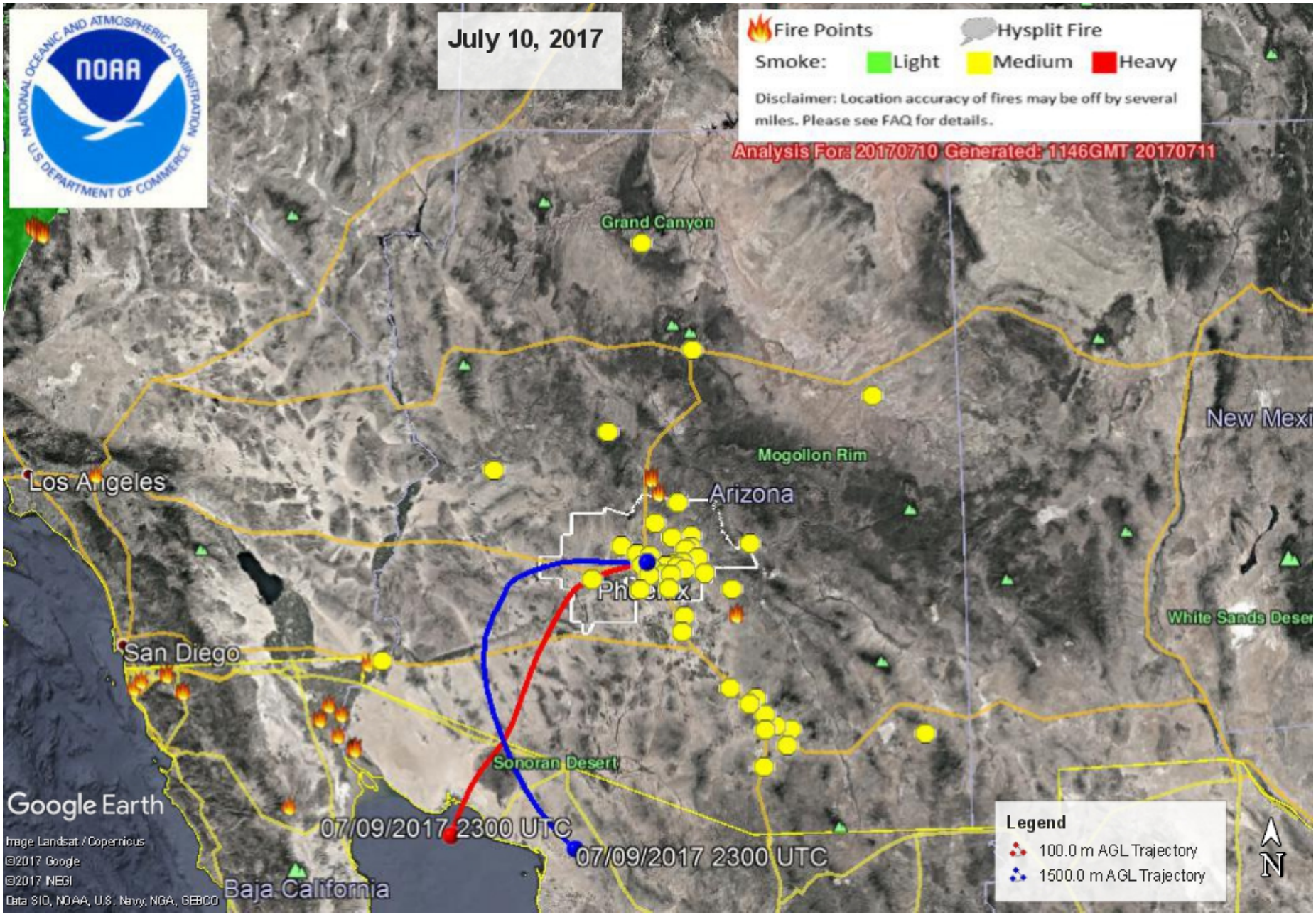


Figure 2-17. NOAA smoke map for July 10, 2017.

Ozone Monitoring Data

Table 2–3 contains the maximum daily eight-hour average ozone concentration for the Maricopa nonattainment ozone monitors from June 30-July 14, 2017. Figures 2–18 and 2–19 provide a graph of the same values for the exceeding monitors and all nonattainment areas monitors, respectively. Figure 2–20 provides the diurnal profile of the exceeding monitors on July 7, 2017.

Tables 2–3 indicates that the only other exceedance day during the week prior, and week after July 7, 2017 in the Maricopa nonattainment area was on July 10, 2017, at the Falcon Field, Mesa and West Phoenix monitors. This non-event exceedance day was much lower in magnitude and scope (maximum ozone concentration of 0.078 ppm); had a different diurnal pattern of ozone; airflow was from a different back trajectory (from the southwest versus the southeast); and wildfire activity in the state had largely ceased. These factors suggest that the exceedance on July 10, 2017 was caused by different factors (i.e., July 10 experienced monsoon activity with late evening thunderstorms, which can result in very stagnant localized air prior to the late evening thunderstorm) then the wildfire-caused exceedance on July 7, 2017. The lack of other exceedances during the week prior to and after July 7, 2017 suggests that a unique set of variables (wildfire emissions) contributed to the ozone exceedances on July 7, 2017.

Additionally, Appendix F contains diurnal pollutant concentrations figures for ozone, nitrogen dioxide (NO_2), particulate matter less than 2.5 micrometers ($PM_{2.5}$) and carbon monoxide (CO) where available at the nine monitors which exceeded the 2008 ozone standard (0.075 ppm) in the Maricopa eight-hour ozone nonattainment area on July 6-8. 2017. Not all monitors collect data on all four pollutants. The nine monitors and the pollutant data they monitor are listed below:

Central Phoenix (04-013-3002)	CO, NO_2 and Ozone
Dysart (04-013-4010)	Ozone
Glendale (04-013-2001)	Ozone and $PM_{2.5}$
Mesa (04-013-1003)	CO, Ozone and $PM_{2.5}$
North Phoenix (04-013-1004)	CO, Ozone and $PM_{2.5}$
Phoenix Supersite (04-013-9997)	CO, NO_2, Ozone and $PM_{2.5}$
Pinnacle Peak (04-013-2005)	Ozone
South Phoenix (04-013-4003)	CO, Ozone and $PM_{2.5}$
West Phoenix (04-013-0019)	CO, NO_2, Ozone and $PM_{2.5}$

The diurnal concentrations on July 6-8, 2017 at each monitoring site in Appendix F are presented alongside the 5^{th}, 50^{th} and 95^{th} percentile concentrations from two monitoring-site specific data sources. The first data source calculates the percentiles based upon data from the monitoring site for the month of July only in years 2013-2017 (designed to limit the comparison to days with similar meteorology). The second data source calculates the percentiles based upon data from the monitoring site for the months of May-August in years 2013-2017 (designed to look at the months when over 90% of the ozone exceedances occur). In calculating the percentiles, the diurnal monitoring data from the two data sources was also grouped by workdays (Monday-Friday) and weekend days (Saturday-Sunday) to account for the reduction in anthropogenic emissions of ozone precursors that occurs on weekend days as compared to workdays in the Maricopa nonattainment area. Diurnal data presented in the main body of this demonstration is calculated using only monitoring data from the month of July in years 2013-2017. Additionally, in calculating the percentiles, the diurnal monitoring data is not grouped, but calculated individually for each day (i.e. the 5^{th} percentile values on July 7, 2017 (a Friday) at the West Phoenix monitor are calculated using only diurnal concentrations from West Phoenix monitoring data for Fridays in July, 2013-2017).

Table 2-3. Maximum Daily Eight-Hour Ozone Concentrations (ppm) at Maricopa Nonattainment Area Monitors on June 30-July 14, 2017.

Monitor	June 30	July 1	July 2	July 3	July 4	July 5	July 6	July 7	July 8	July 9	July 10	July 11	July 12	July 13	July 14
Apache Junction								0.066	0.052	0.065	0.075	0.059	0.054	0.064	0.062
Blue Point	0.058	0.052	0.041	0.046	0.048	0.055	0.061	0.063	0.048	0.055	0.068	0.066	0.059	0.056	0.051
Buckeye	0.057	0.055	0.046	0.042	0.048	0.044	0.048	0.063	0.053	0.060	0.058	0.053	0.039	0.035	0.041
Cave Creek	0.066	0.064	0.055	0.044	0.052	0.050	0.057	0.072	0.056	0.054	0.062	0.059	0.059	0.048	0.050
Central Phoenix	**0.062**	**0.057**	**0.047**	**0.045**	**0.054**	**0.050**	**0.059**	**0.078**	**0.053**	**0.063**	**0.075**	**0.056**	**0.051**	**0.045**	**0.054**
Dysart	**0.063**	**0.061**	**0.052**	**0.042**	**0.051**	**0.047**	**0.054**	**0.087**	**0.057**	**0.057**	**0.064**	**0.057**	**0.050**	**0.043**	**0.049**
Falcon Field	0.057	0.054	0.045	0.050	0.057	0.058	0.071	0.071	0.055	0.065	0.076	0.067	0.061	0.060	0.066
Fountain Hills	0.059	0.057	0.047	0.050	0.056	0.056	0.063	0.069	0.056	0.060	0.070	0.060	0.059	0.055	0.054
Glendale	**0.059**	**0.057**	**0.048**	**0.042**	**0.045**	**0.043**	**0.048**	**0.079**	**0.054**	**0.049**	**0.061**	**0.053**	**0.041**	**0.039**	**0.048**
Humboldt Mountain	0.069	0.065	0.053	0.044	0.053	0.054	0.058	0.064	0.058	0.058	0.063	0.057	0.059	0.051	0.054
Mesa	**0.060**	**0.057**	**0.046**	**0.048**	**0.060**	**0.056**	**0.072**	**0.078**	**0.059**	**0.069**	**0.078**	**0.067**	**0.056**	**0.055**	**0.068**
North Phoenix	**0.067**	**0.065**	**0.051**	**0.047**	**0.054**	**0.051**	**0.060**	**0.085**	**0.056**	**0.061**	**0.073**	**0.060**	**0.053**	**0.049**	**0.060**
Phoenix Supersite	**0.062**	**0.058**	**0.046**	**0.041**	**0.049**	**0.046**	**0.055**	**0.086**	**0.054**	**0.061**	**0.075**	**0.060**	**0.050**	**0.045**	**0.057**
Pinnacle Peak	**0.070**	**0.065**	**0.054**	**0.050**	**0.056**	**0.057**	**0.065**	**0.077**	**0.059**	**0.060**	**0.072**	**0.064**	**0.064**	**0.057**	**0.057**
Rio Verde	0.057	0.053	0.043	0.042	0.047	0.049	0.053	0.059	0.045	0.048	0.054	0.048	0.047	0.042	0.037
South Phoenix	**0.059**	**0.058**	**0.046**	**0.043**	**0.053**	**0.048**	**0.054**	**0.077**		**0.065**	**0.073**	**0.055**	**0.046**	**0.044**	**0.050**
South Scottsdale	0.058	0.056	0.043	0.045	0.057	0.050	0.065	0.070	0.051	0.060	0.070	0.059	0.056	0.049	0.061
Tempe	0.051	0.048	0.039	0.039	0.050	0.044	0.055	0.065	0.050	0.058	0.064	0.052	0.047	0.045	0.056
West Chandler	0.056	0.054	0.042	0.046	0.055	0.052	0.065	0.074	0.055	0.068	0.074	0.058	0.054	0.052	0.057
West Phoenix	**0.062**	**0.062**	**0.051**	**0.045**	**0.052**	**0.050**	**0.058**	**0.084**	**0.056**	**0.063**	**0.077**	**0.059**	**0.049**	**0.045**	**0.055**

Note: Monitors that exceeded on July 7, 2017 in red font.

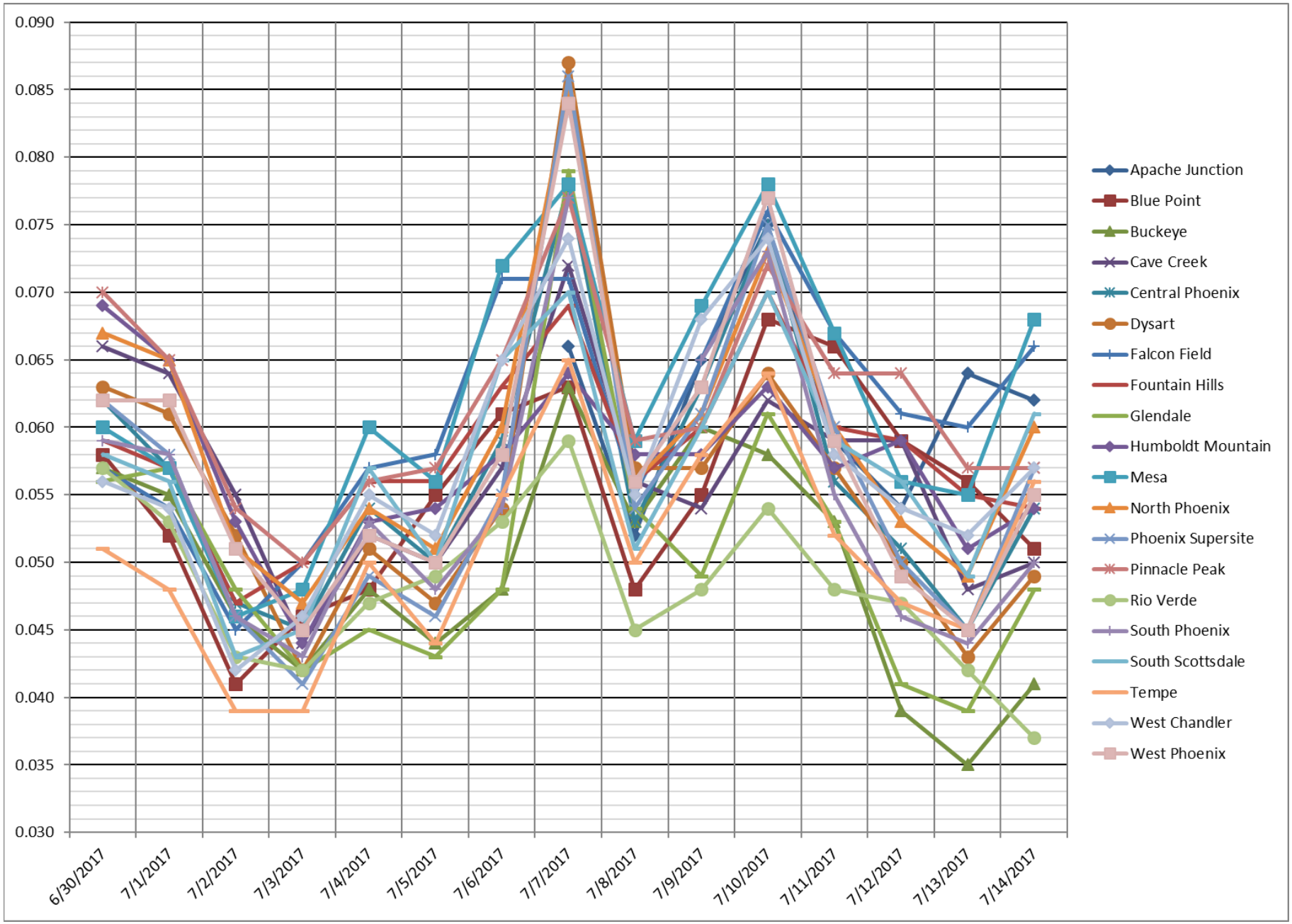


Figure 2-18. Maximum daily eight-hour ozone concentrations (ppm) at the nonattainment area monitors on June 30–July 14, 2017.

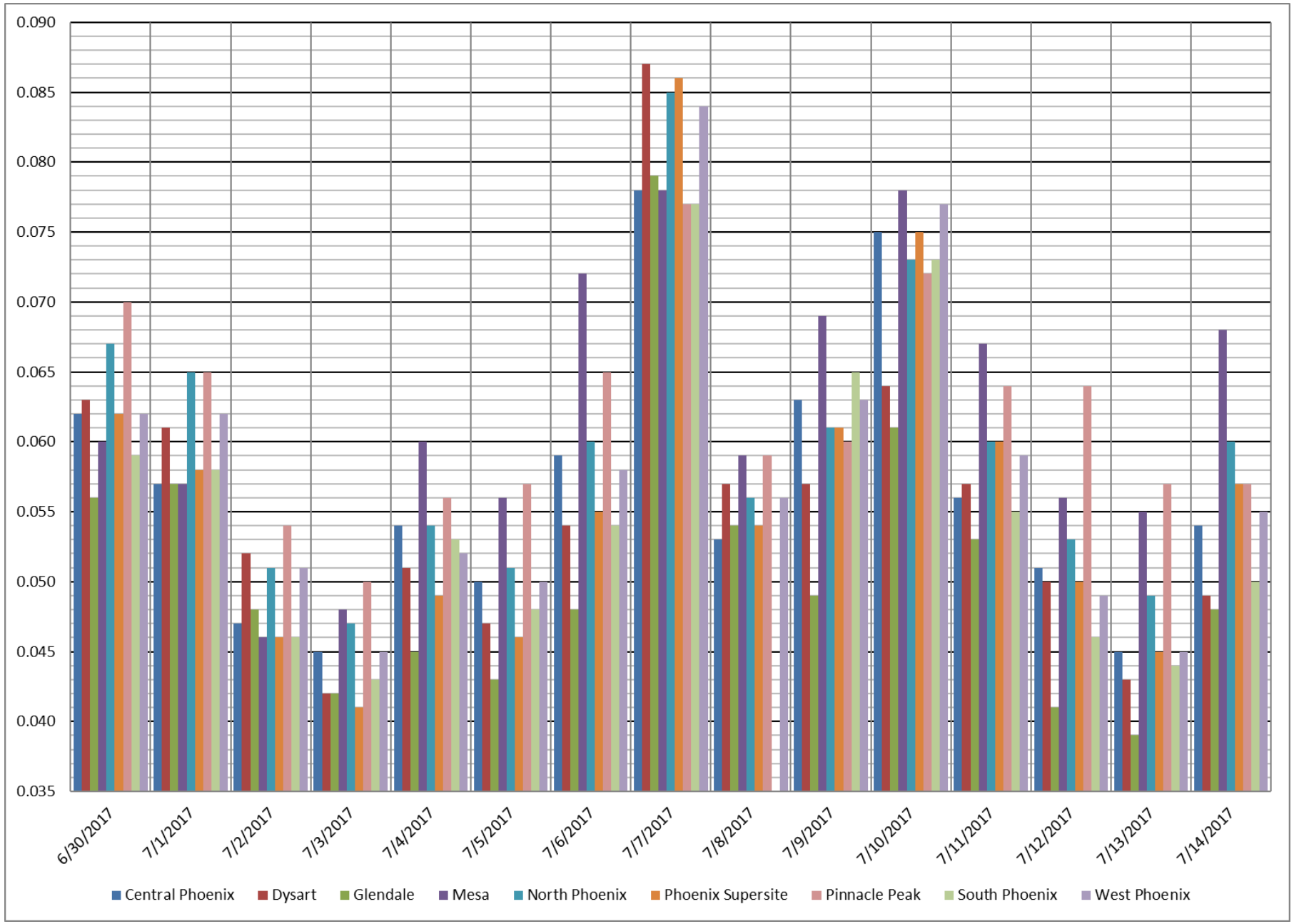


Figure 2-19. Maximum daily eight-hour ozone concentrations (ppm) at the exceeding monitors on June 30-July 17, 2017.

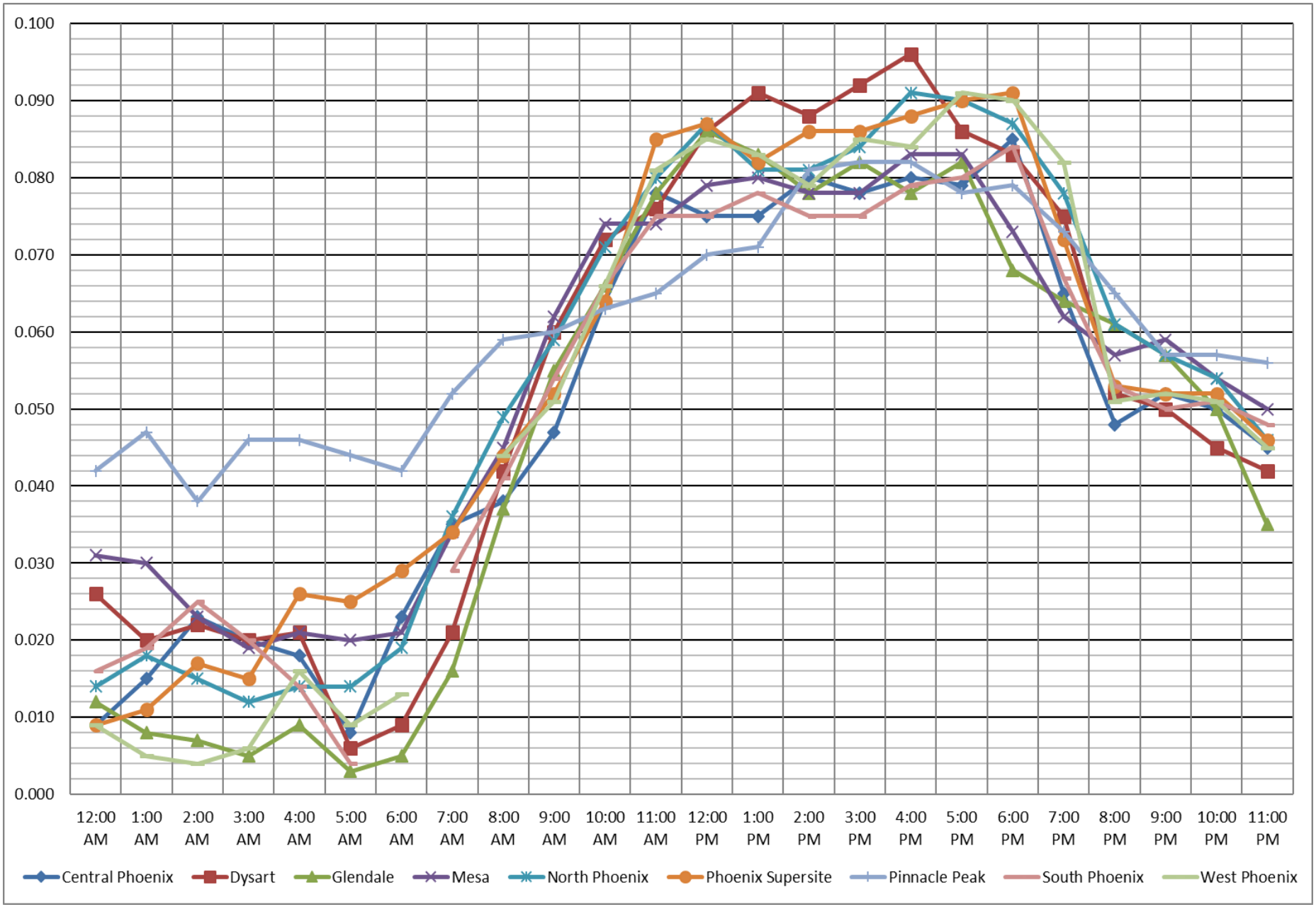


Figure 2-20. Diurnal profile of exceeding monitors on July 7, 2017.

III. CLEAR CAUSAL RELATIONSHIP

Introduction

This section of the documentation provides several pieces of evidence that the wildfire affected air quality in such a way that a clear causal relationship between the wildfire and the monitored exceedances is apparent. EPA's September 2016 final *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations* (Wildfire Guidance) states that "Air agencies should support the clear causal relationship with a comparison of the O_3 data requested for exclusion with historical concentrations at the monitor. In addition...air agencies should further support the clear causal relationship criterion by demonstrating that the wildfire's emissions were transported to the monitor, that the emissions from the wildfire influenced the monitored concentrations, and, in some cases, quantifying the contribution of the wildfire's emissions to the monitored O_3 exceedance or violation." Demonstrations covering all of the elements of a clear causal relationship stated by EPA are presented in the sections below.

Comparison of Event Concentrations with Historical Concentrations

As part of the demonstration that air quality was affected by the wildfire event, and to begin to establish the clear causal relationship between the event and the exceedances, a comparison of the exceeding ozone concentrations on July 7, 2017 is compared to the historical ozone season concentrations. One of the comparisons recommended by EPA in the Wildfire Guidance is a comparison of the event concentration at the exceeding monitor to the 5-year historical ozone season concentrations at the same monitor. As the examples in the Guidance include the months of April-October as representative of the ozone season, the graphs below include historical ozone concentration data from the months of April through October.

The graphs of the 5-year historical ozone season concentrations for each of the exceeding monitors are included in Figures 3–1 through 3–9. The figures include a line demarcating the 2008 ozone standard (0.075 ppm), with all exceedances of this standard shown as blue dots above this line. The wildfire event on July 7, 2017 is represented as a red dot. While there is a strong likelihood that some of the historical exceedances may have been impacted by wildfires, only one documented exceedance day caused by a prior wildfire (June 20, 2015) is indicated on the figures by a red dot. The 99th percentile value for the 5-year, ozone season (April-October, 2013-2017) is also listed on each figure and indicated as a green dashed line. All but two of the nine exceeding monitors had maximum daily eight-hour average ozone concentrations on July 7, 2017 that were at or above the 5-year, ozone season 99th percentile. For Pinnacle Peak, which had a concentration below the 99th percentile, the exceedance on July 7, 2017 was tied for the second highest daily maximum 8-hour average ozone concentration recorded at Pinnacle Peak in 2017. For Mesa, which also had a concentration below the 99th percentile, the exceedance on July 7, 2017 was tied for the fourth highest daily maximum 8-hour average ozone concentration recorded at Mesa in 2017.

The uniqueness of this exceedance event in terms of historical concentrations is most evident at the Dysart monitor. For the Dysart monitor, the concentration recorded on July 7, 2017 was the highest ever recorded (monitoring began in 2003), is 4 ppb higher than any previously recorded exceedance, and is also 13 ppb higher than the 99th percentile value. This large deviation from the norm suggests at the very least that a unique event occurred beyond the "normal" exceedances associated with a particular meteorological condition(s) and/or increases in an anthropogenic emission source(s).

Additionally, Appendix F contains diurnal pollutant concentrations figures for ozone, nitrogen dioxide (NO_2), particulate matter less than 2.5 micrometers ($PM_{2.5}$) and carbon monoxide (CO) where available at the nine monitors which exceeded the 2008 ozone standard (0.075 ppm) in the Maricopa eight-hour ozone nonattainment area on July 6-8. 2017. Not all monitors collect data on all four pollutants. The nine monitors and the pollutant data they monitor are listed below:

Central Phoenix (04-013-3002)	CO, NO_2 and Ozone
Dysart (04-013-4010)	Ozone
Glendale (04-013-2001)	Ozone and $PM_{2.5}$
Mesa (04-013-1003)	CO, Ozone and $PM_{2.5}$
North Phoenix (04-013-1004)	CO, Ozone and $PM_{2.5}$
Phoenix Supersite (04-013-9997)	CO, NO_2, Ozone and $PM_{2.5}$
Pinnacle Peak (04-013-2005)	Ozone
South Phoenix (04-013-4003)	CO, Ozone and $PM_{2.5}$
West Phoenix (04-013-0019)	CO, NO_2, Ozone and $PM_{2.5}$

The diurnal concentrations on July 6-8, 2017 at each monitoring site in Appendix F are presented alongside the 5^{th}, 50^{th} and 95^{th} percentile concentrations from two monitoring-site specific data sources. The first data source calculates the percentiles based upon data from the monitoring site for the month of July only in years 2013-2017 (designed to limit the comparison to days with similar meteorology). The second data source calculates the percentiles based upon data from the monitoring site for the months of May-August in years 2013-2017 (designed to look at the months when over 90% of the ozone exceedances occur). In calculating the percentiles, the diurnal monitoring data from the two data sources was also grouped by workdays (Monday-Friday) and weekend days (Saturday-Sunday) to account for the reduction in anthropogenic emissions of ozone precursors that occurs on weekend days as compared to workdays in the Maricopa nonattainment area. Diurnal data presented in the main body of this demonstration is calculated using only monitoring data from the month of July in years 2013-2017. Additionally, in calculating the percentiles, the diurnal monitoring data is not grouped, but calculated individually for each day (i.e. the 5^{th} percentile values on July 7, 2017 (a Friday) at the West Phoenix monitor are calculated using only diurnal concentrations from West Phoenix monitoring data for Fridays in July, 2013-2017).

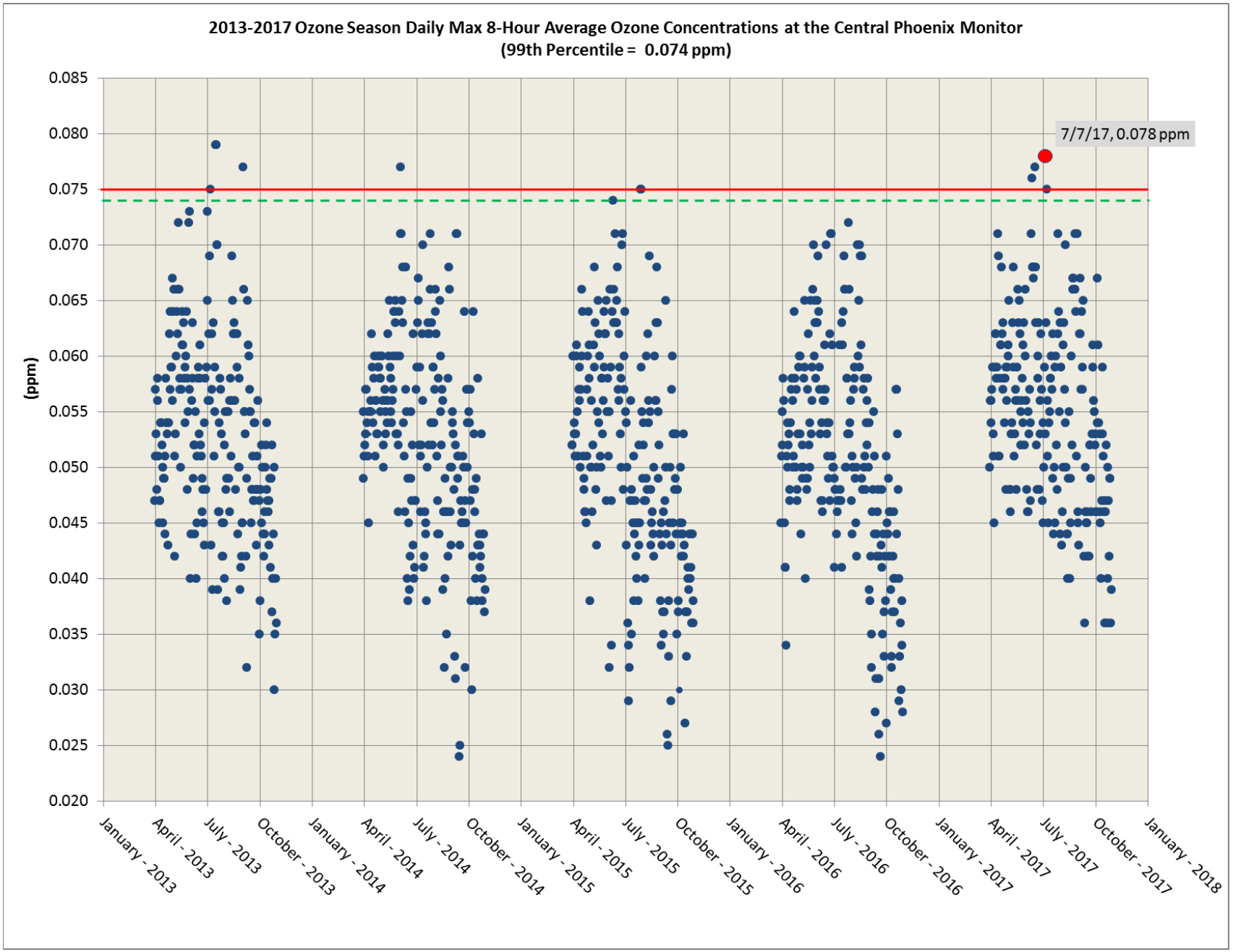


Figure 3-1. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Central Phoenix monitor.

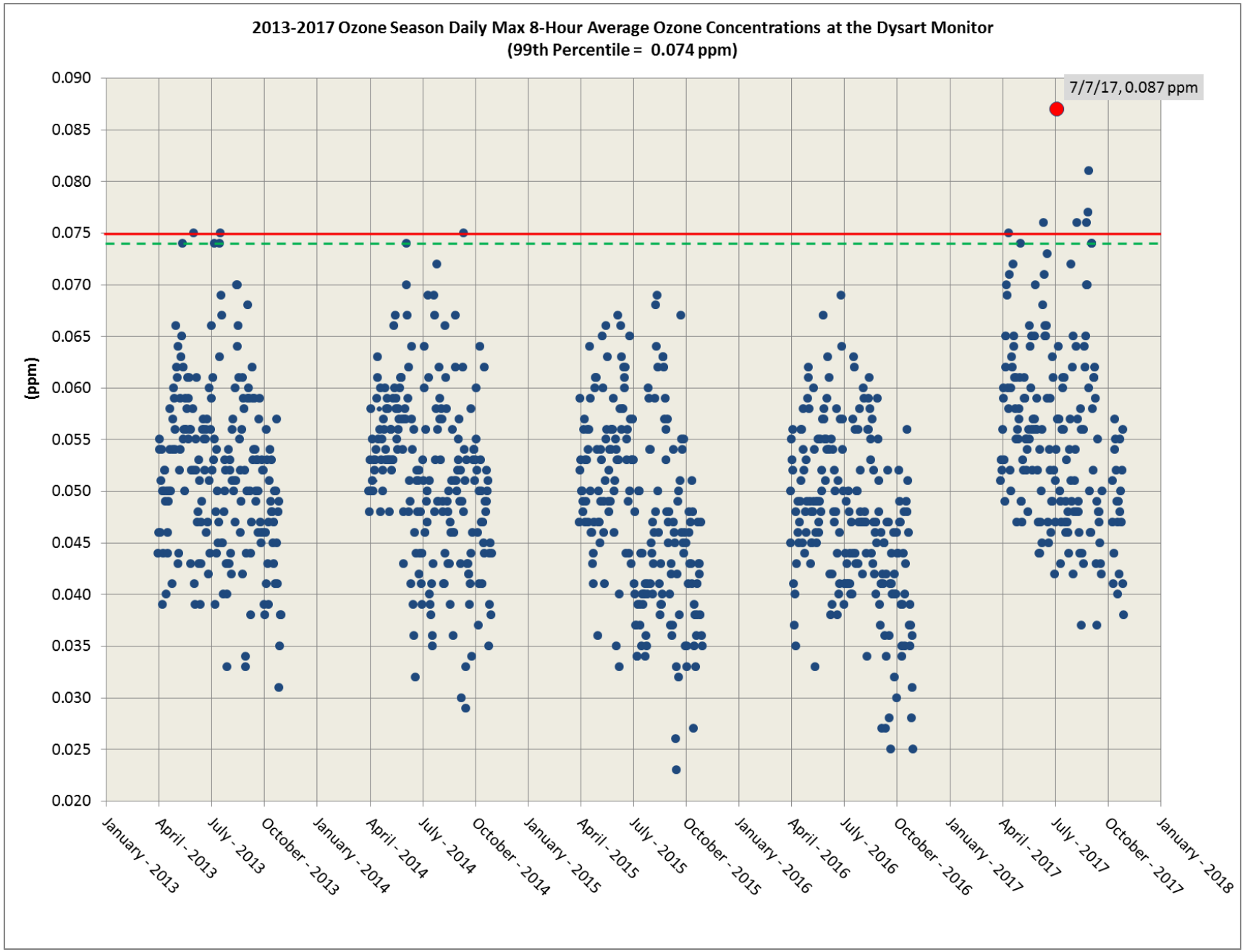


Figure 3-2. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Dysart monitor.

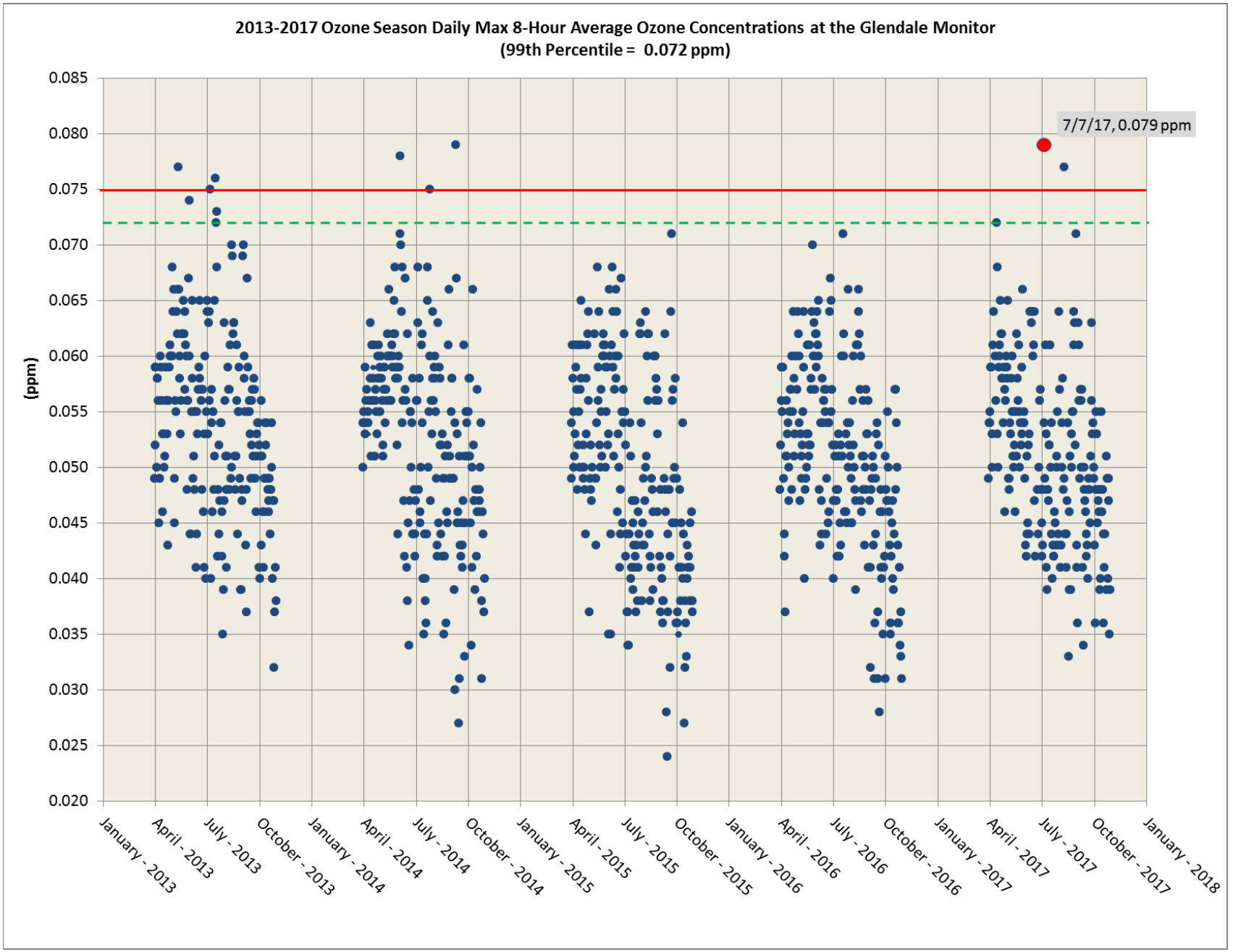


Figure 3-3. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Glendale monitor.

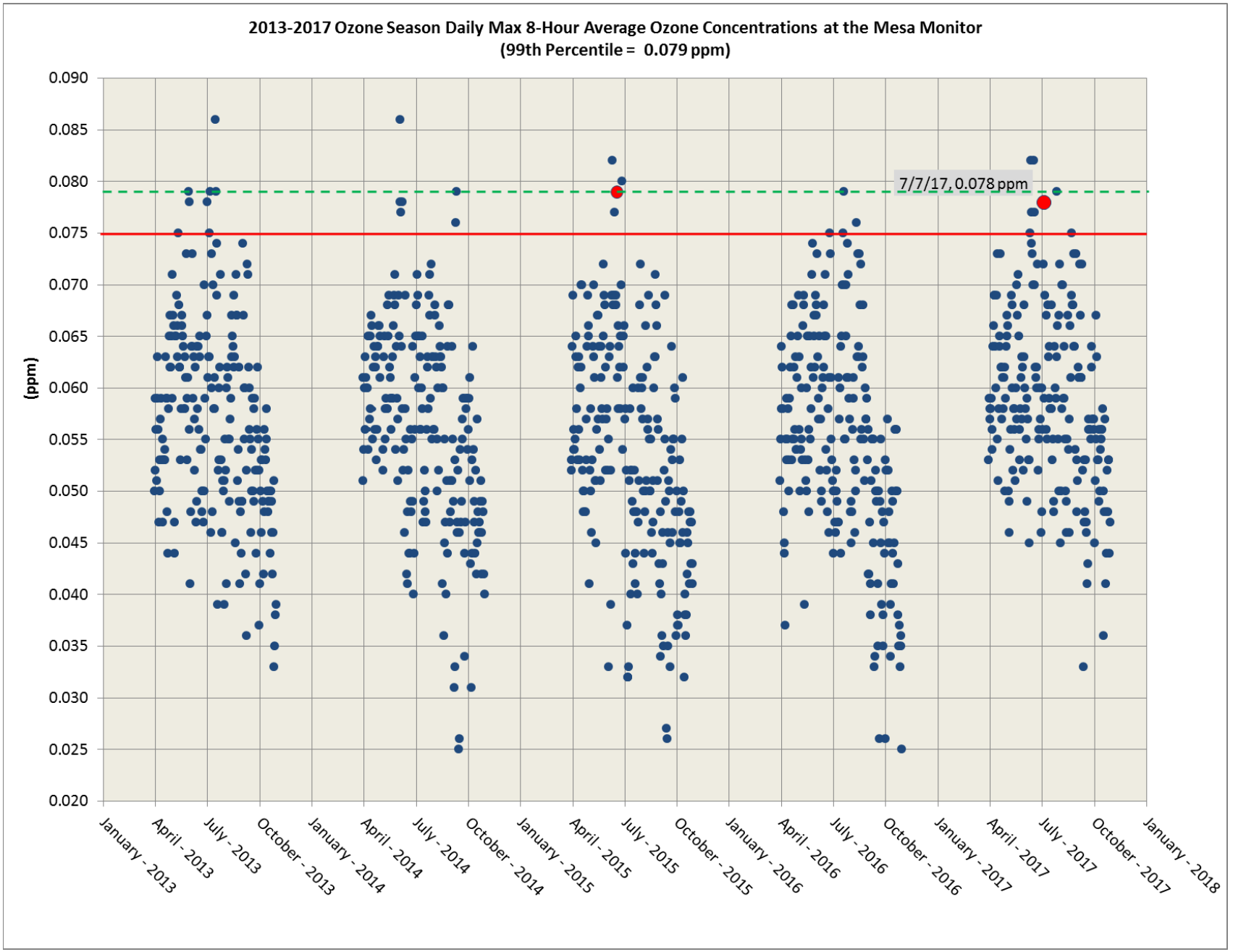


Figure 3-4. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Mesa monitor.

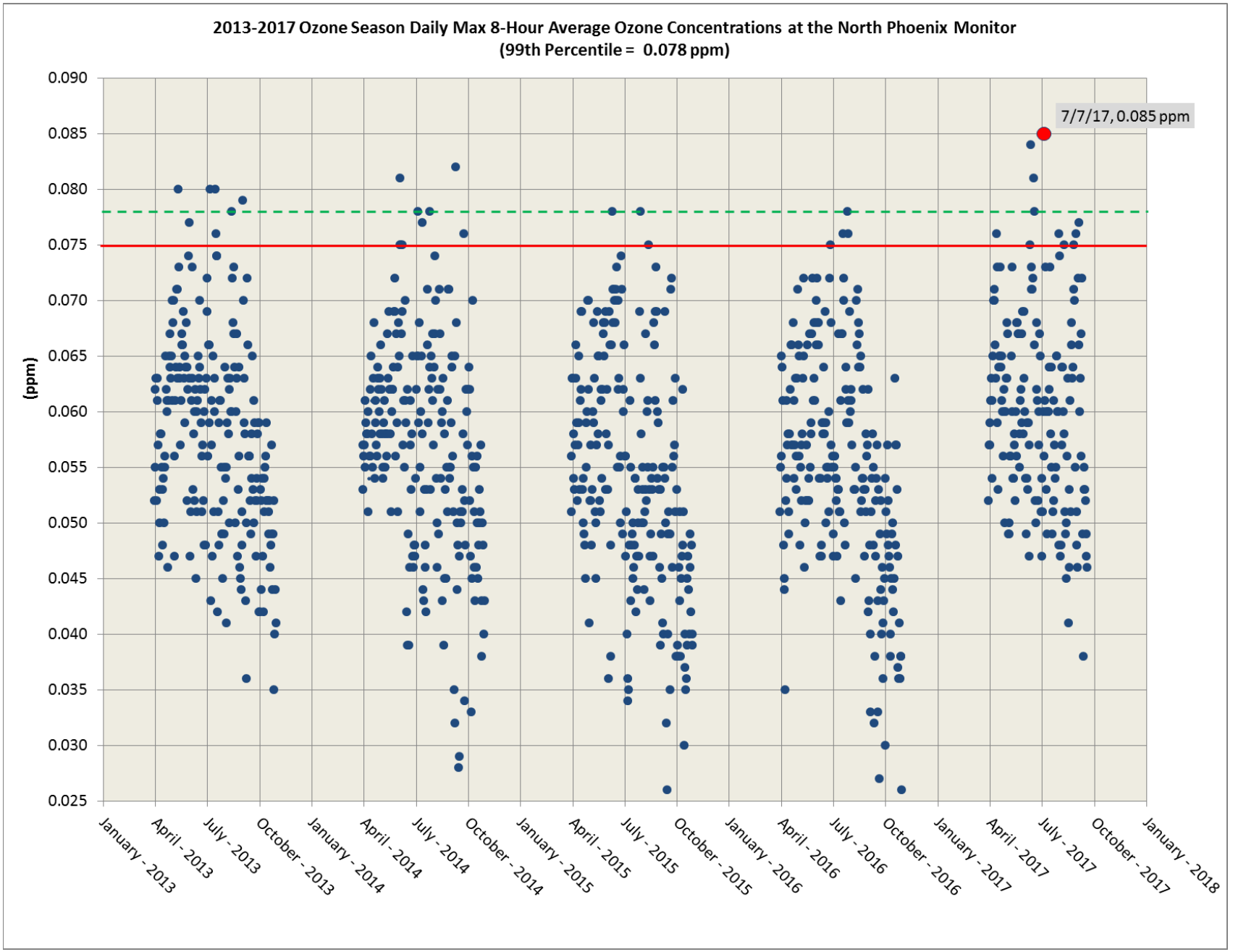


Figure 3-5. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the North Phoenix monitor.

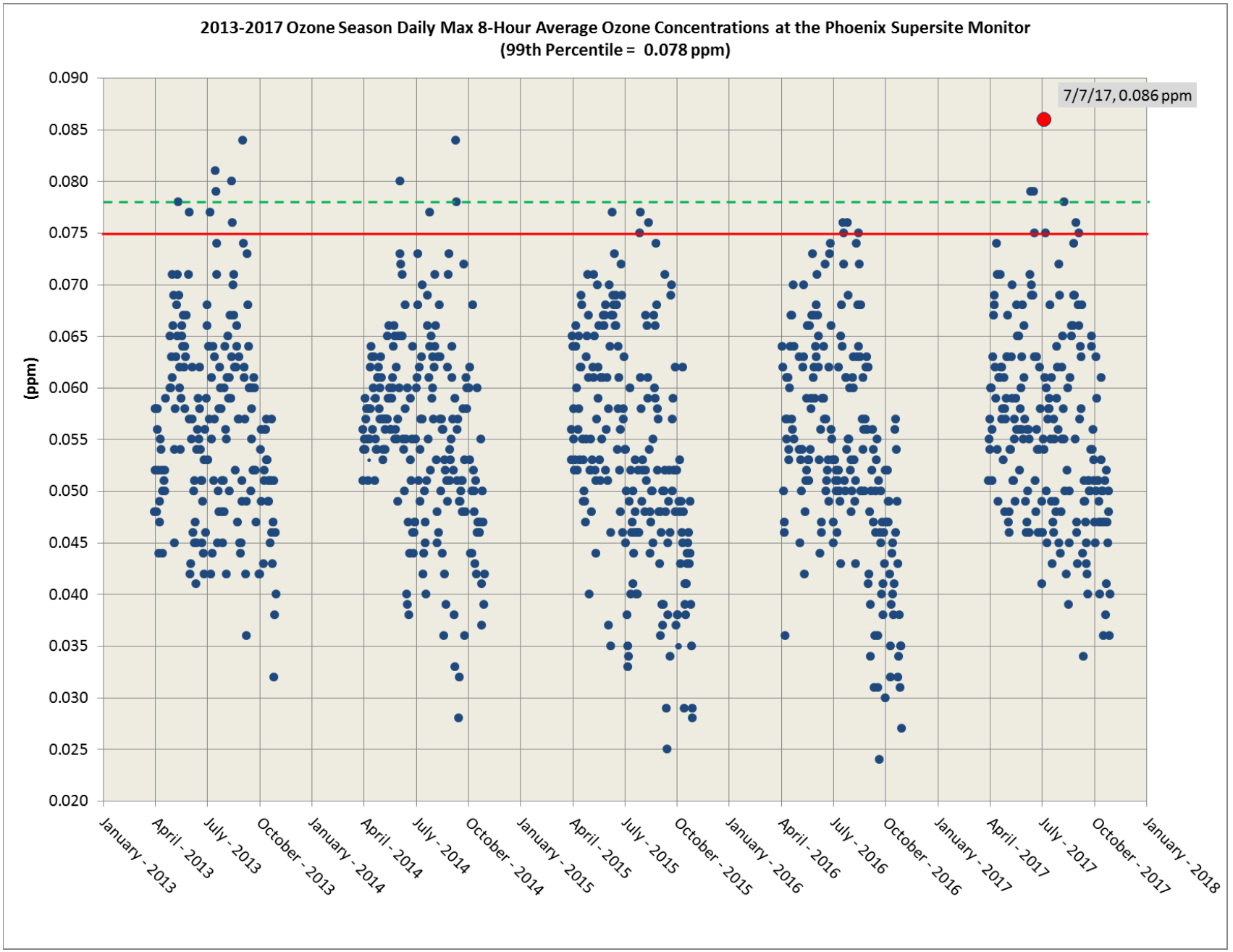


Figure 3-6. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Phoenix Supersite monitor.

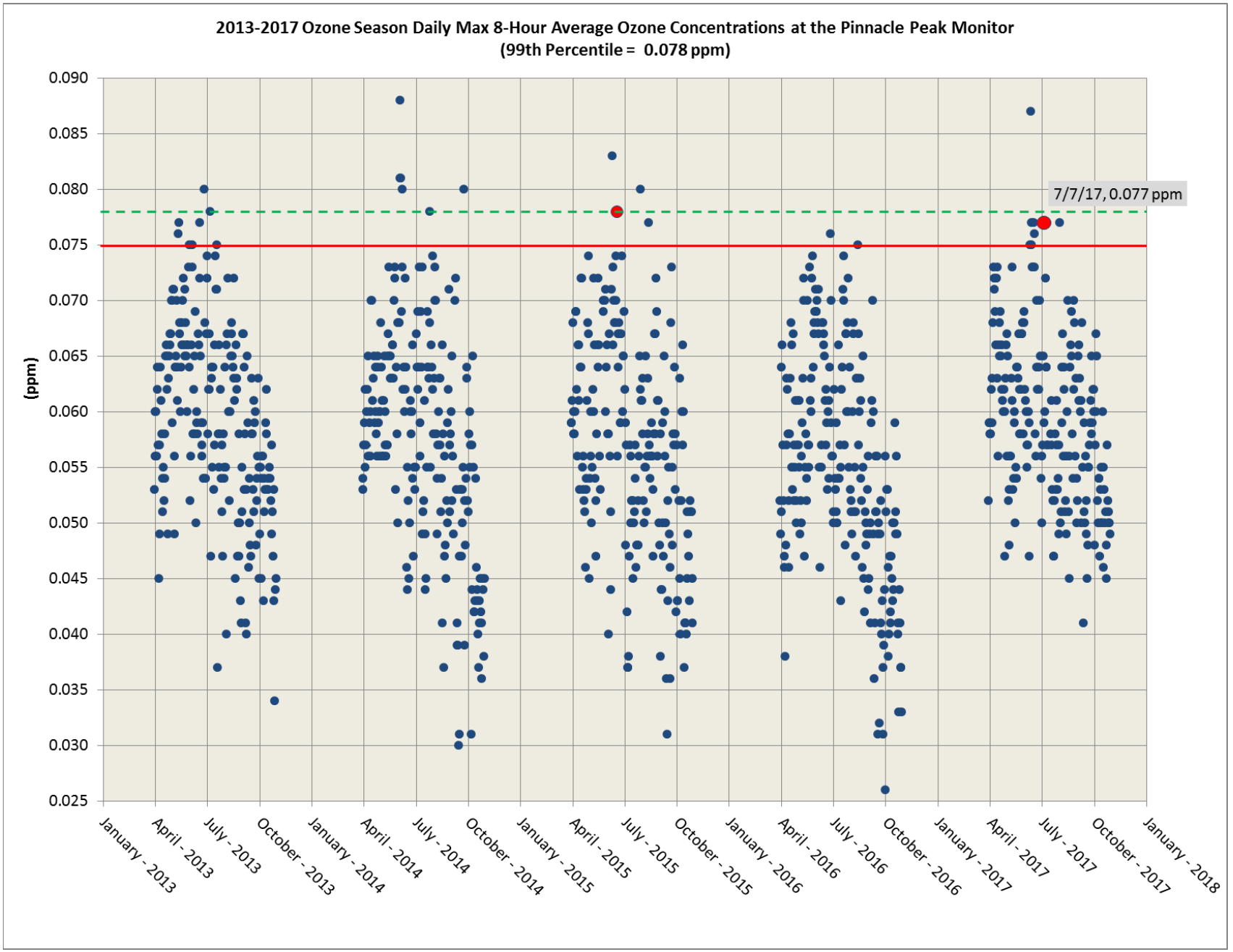


Figure 3-7. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Pinnacle Peak monitor.

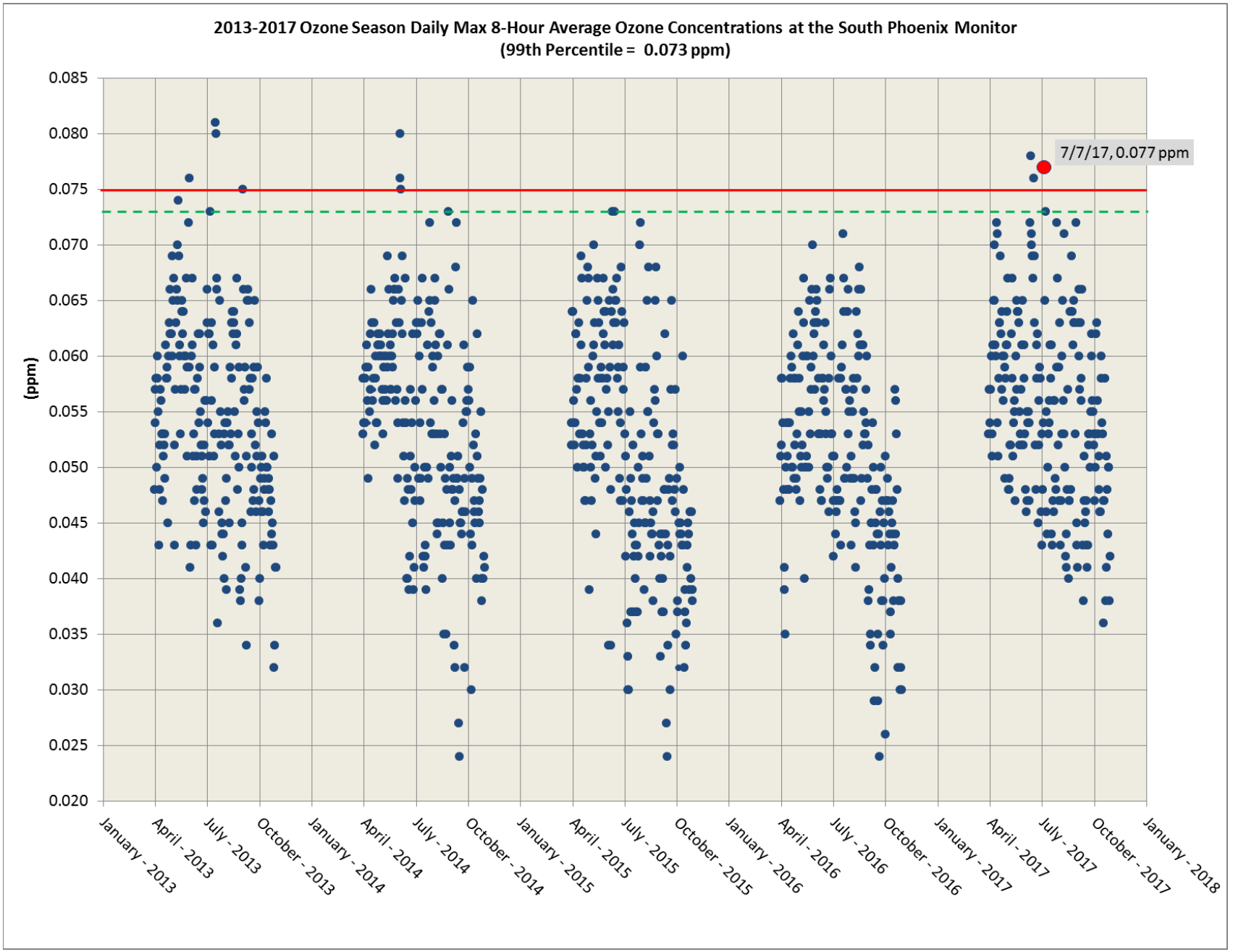


Figure 3-8. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the South Phoenix monitor.

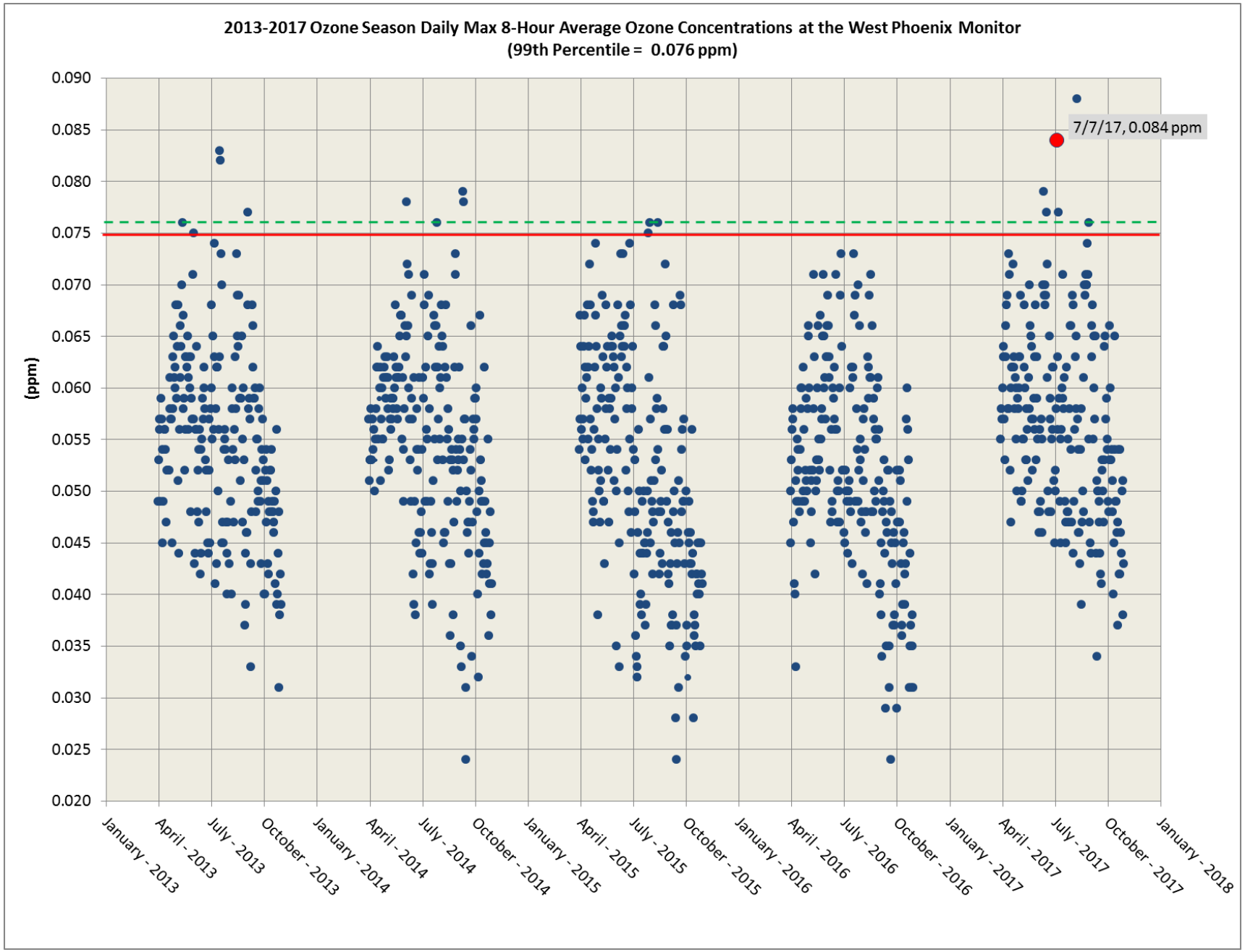


Figure 3-9. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the West Phoenix monitor.

Tiered Approach

EPA's Wildfire Guidance establishes demonstration tiers for determining the level of evidence needed to document an exceptional event in conjunction with reviewing each demonstration on a case-by-case basis using a weight of the evidence approach. Three tiers are described in the Guidance:

- Tier 1 demonstrations are reserved for the clearest events, such as events where the wildfire is located in close proximity to a monitor or when the wildfire occurs during the time of year with typically low ozone concentrations. These demonstrations require the least amount of evidence and documentation.

- Tier 2 demonstrations are used when impacts from the wildfire are less clear, such as events when the concentrations are only a few parts per billion over the standard or events that occur during the ozone season when ozone concentrations may be high apart from the event contribution. Tier 2 demonstrations require more evidence than Tier 1 demonstrations.

- Tier 3 demonstrations are used when the relationship between the wildfire and the influenced ozone concentrations are the most complex. The level of documentation and evidence required is highest for Tier 3 demonstrations. The Guidance suggests discussing with EPA Regional Offices the appropriate level of evidence needed for a Tier 3 demonstration.

To help determine when a Tier 1, Tier 2, or Tier 3 demonstration is required, the Wildfire Guidance identified "key factors" that act as screening tool for selecting a suitable tier for a given event. According to the Guidance, the relationships of the event to the key factors identify which tier is most appropriate for the event and may help to inform the amount of information needed in higher tier demonstrations.

The key factor for a Tier 1 demonstration is the "[s]easonality and/or distinctive level of the monitored O_3 concentration". Tier 1 demonstrations are meant to apply to ozone exceedances that occur outside the ozone season or have concentrations that are at least 5-10 parts per billion higher than non-event related concentrations. Since the exceedances in this documentation occurred during the middle of the ozone season, the event will likely need either a Tier 2 or Tier 3 demonstration. However, the exceedance at the Dysart monitor is 4 ppb higher than any previously recorded exceedance, and is also 13 ppb higher than the 99th percentile value, suggesting at the very least that a unique, non-normal exceedance event occurred on July 7, 2017.

The Guidance lists two key factors for a Tier 2 demonstration: (1) "Fire emissions and distance of fire(s) to affected monitoring site location(s)"; and (2) "Comparison of the event related O_3 concentration with non-event related high O_3 concentrations". Key factor #1 includes an emissions/distance (Q/D) threshold of 100 tons per day/kilometer to compare against the emissions from the event. If the event Q/D ratio is greater than or equal to 100 tpd/km than a Tier 2 demonstration may be appropriate. For events with Q/D less than 100 tpd/km, the Guidance recommends preparing a Tier 3 demonstration. Key factor #2 recommends limiting Tier 2 demonstrations to events where the event concentration is in the 99th percentile of a 5-year record of ozone season concentrations, or if the event concentration is one of the four highest within the event year.

A detailed discussion of the key factors for a Tier 2 demonstration in relation to the event on July 7, 2017 is included below. In summary, for the event exceedances that occurred on July 7, 2017, the Tier 2 demonstration key factor #1 is not met, as the Q/D in this event is less than 100 tpd/km. However, key factor #2 is met for this event, as 7 of the 9 exceedances were at or above the 99th percentile and the other

two exceeding sites had an ozone concentration that was at least the fourth highest in 2017. Given that only one of the two key factors was met for the event on July 7, 2017, this documentation includes evidence sufficient to satisfy a Tier 3 demonstration. The appropriate level of evidence needed for the Tier 3 demonstration has been discussed with EPA Regional IX staff prior to submittal of this documentation.

Tier 2 Key Factor #1

Key factor #1 for a Tier 2 demonstration requires the estimation of daily emissions of the wildfire to produce a daily ratio (Q/D) of total tons per day of NO_x and VOC divided by the distance of the wildfire to the affected ozone monitors. If the Q/D for the event is 100 tpd/km or greater, a Tier 2 demonstration is sufficient. If the Q/D is less than 100 tpd/km, a Tier 3 demonstration is recommended.

For the event on July 7, 2017 the U.S. Forest Service BlueSky Playground tool 2.0 beta (http://www.airfire.org/data/playground/) was used to estimate the emissions of NO_x and VOC emitted by the wildfires in southeastern Arizona. The central coordinates for each wildfire were entered into the tool. Default fuels data for those coordinates was selected, as well as a moisture level of "dry", given the area was listed as either in moderate drought or abnormally dry on the July 4, 2017 U.S. Drought Monitor for Arizona. Since emissions from the wildfires can accumulate over time to produce ozone and ozone precursor emissions, emissions from fires active on July 5-7, 2017 were considered. The area assumed to be burned by a particular fire was based upon the growth in the fire perimeter that occurred over a previous day as recorded by Inciweb or the Arizona Department of Forestry and Fire Management.

According to the tool results, from July 5 to July 7, 2017 the wildfires emitted a combined 3-day total of 4,561 tons of NO_x and VOC. Emissions produced by the tool for wildfires burning on July 5-7, 2017 were then distance-weighted per the methodology in the Wildfire Guidance to account for the varying distances of the wildfires to the Maricopa nonattainment area. This produces a 3-day distance-weighted Q/D ratio of 21.09 tons of NO_x and VOC per km. Table 3–1 provides a summary of the inputs and resulting emissions estimated by the tool for each wildfire, as well as the final distance-weighted emissions.

While the Q/D ratio is under the recommended 100 tpd/km threshold mentioned in the Guidance, the weight of evidence presented throughout this documentation clearly indicates ozone impacts at the Maricopa nonattainment area monitors from the wildfires' emissions. Additionally, while the Wildfire Guidance uses Q/D as a screening tool for the level of documentation needed in an event demonstration, it is important to point out that academic research[1] on the behavior of ozone production from a wildfire generally concludes that ozone production may increase with distance from the wildfire. This observed behavior is not represented accurately in the Q/D ratio and may run counter to the assumptions of a Q/D ratio in many cases. As such, more weight should be given to direct evidence that the wildfire emissions affected the monitors (e.g., observed ozone levels, smoke distribution maps, timing and spatial distribution of other pollutants like NO_2 and $PM_{2.5,}$ etc.) than relying on the Q/D ratio to represent relative levels of ozone production as distance from the wildfires increase.

[1] Jaffe and Widger, 2012. Ozone production from wildfires: A critical review. Atmospheric Environment 51, 1-10.

Table 3-1. Distance-Weighted Q/D for Actively Burning Wildfires on July 5-7, 2017.

Wildfire	Perimeter Expansion on 7/5/17 (acres)	Perimeter Expansion on 7/6/17 (acres)	Perimeter Expansion on 7/7/17 (acres)	Bluesky NOx for 7/5-7/7 (tons)	Bluesky VOC for 7/5-7/7 (tons)	Bluesky NOx and VOC totals (tons)	Distance to Phoenix Supersite Monitor (km)	Individual Q/D (*Not Weighted*)	All Fires Distance Weighted Q/D
Burro	1,816	999	570	41.91	400.00	441.91	187	2.36	NA
Crack Tank	0	0	70	0.65	5.26	5.91	204	0.03	NA
Elk Horn	339	95	0	0.44	3.63	4.07	194	0.02	NA
Frye	288	640	0	67.09	1,197.16	1,264.24	226	5.59	NA
Hilltop	5,880	2,138	2,420	106.46	1,268.28	1,374.74	165	8.33	NA
SH Creek	0	2,723	0	62.15	898.82	960.97	255	3.77	NA
Sheep	0	2,800	1,100	48.29	460.86	509.15	283	1.80	NA
TOTALS:	8,323	9,395	4,160	326.99	4,234.01	4,561.00	NA	21.91	**21.09**

Tier 2 Key Factor #2

The second key factor in a Tier 2 demonstration involves a comparison of the event concentration to the historical distribution of ozone concentrations at the affected monitor. This key factor is considered met when the event concentration is in the 99th or higher percentile of the 5-year distribution of ozone monitoring data, or is one of the four highest ozone concentrations within the exceedance year.

Plots showing this comparison at each of the nine exceeding monitors have already been presented earlier in this section (see Figures 3–1 through 3–9). Those plots show that seven of the nine exceeding monitors had event concentrations that were at or above the 99th percentile of the 5-year historical ozone season concentrations. For the two exceeding monitors that had an event concentration below the 99th percentile (Pinnacle Peak), the event was at least the fourth highest ozone concentration recorded in 2017. Therefore, the event concentrations on July 7, 2017 meet the requirements of key factor #2.

Additional Evidence of a Clear Causal Relationship

In addition to evaluating key factors, the Wildfire Guidance requires a clear causal relationship demonstration to provide evidence showing: (1) that the wildfire emissions were transported to the affected monitor; and (2) that the wildfire emissions affected the monitored ozone concentrations. The following subsections provide multiple pieces of evidence demonstrating that the emissions from the fire were both transported to the monitors and affected the ozone concentrations at the monitors in the Maricopa nonattainment area.

The Wildfire Guidance suggests that in the case of a Tier 3 demonstration, the inclusion of additional evidence that the wildfire caused the ozone exceedance may be required. The Guidance provides three additional sources of evidence that may be used in a Tier 3 demonstration: (1) Comparison of ozone concentrations on meteorologically similar days ("matching days" analysis); (2) Statistical regression modeling; and (3) Photochemical modeling. For this documentation, a comparison of ozone concentrations on (1) meteorologically similar days and on (2) days with monitored non-event exceedances was used to provide the additional evidence sought in a Tier 3 demonstration.

Evidence that the Wildfire Emissions were Transported to the Affected Monitors

HYSPLIT Back Trajectories

The National Oceanic and Atmospheric Administration (NOAA) HYSPLIT model was run to produce 24-hour back trajectories of air parcel movement at lower, mid and upper altitudes (100, 500 and 1500 meters) for each of the nine exceeding ozone monitoring sites. The Wildfire Guidance recommends selecting heights no lower than 100 meters to avoid interference with the terrain and no higher than 1500 meters to confine the air parcel to within the mixing layer. The back trajectories are intended to represent the transport of air from areas near the southeastern Arizona wildfires to the Maricopa nonattainment area on July 7, 2017.

Figures 3–10 through 3–18 display the lower, mid and upper back trajectories at each exceeding monitoring site on July 7, 2017. The back trajectories end at 4:00 pm, generally representing the peak ozone concentration hour on July 7, 2017 for each of the exceeding monitors. Each hour of the 24-hour

back trajectory is represented by a dot on the Figures (red dots are at 100 meters, blue 500 meters, and green 1500 meters). The figures clearly show that the air from areas near or affected by, smoke, ozone and ozone precursor emissions from the southeastern Arizona wildfires, reached the exceeding Maricopa nonattainment area monitors. The output pdf files from the NOAA HYSPLIT model back trajectory runs are included in Appendix B. While not shown in Figures 3–10 through 3–18, Appendix B shows the vertical movement air for each of the back trajectories shown in Figures 3–10 through 3–18. For the 100-meter back trajectory, seven of the nine trajectories start at height ranging between 500-2000 meters, indicating that smoke, ozone and ozone wildfire precursor emissions aloft from the wildfires were likely transported to the ground level as indicated by the HYSPLIT back trajectories.

Satellite Images of Smoke Plumes from Wildfires in Conjunction with a Concurrent Rise in Regional Ozone Concentrations in the Maricopa Nonattainment Area and Southeastern Arizona

Smoke from the southeastern Arizona wildfires is visible on satellite photos all of the days during the period of July 1-7, 2017. After July 8, 2017, smoke is no longer visible (or barely visible) on the satellite photos as fire activity has diminished significantly. The satellite photos are taken between the times of 10:00 am to 2:00 pm, Arizona local time. When the photos are taken earlier in the morning, the smoke plumes are generally less, as wildfire activity and smoke production usually picks up in the afternoon when winds increase. On July 7, 2017, smoke form these wildfires can be seen drifting into or near the Maricopa nonattainment area. Figures 3–19 through 3–28 show the satellite photos of southeastern Arizona and the Maricopa nonattainment area from the MODIS Aqua or Terra satellites on July 1-10, 2017. 24-hour back trajectories from the Phoenix Supersite monitor are also included on the figures to show the direction of airflow on each day the satellite photo was taken. The level of smoke seen on the satellite photos corresponds with the amount of smoke predicted by the NOAA smoke maps as displayed earlier in Figures 2–8 through 2–17.

In addition to the satellite images of wildfire smoke, Figures 3–19 through 3–28 also display the maximum daily 8-hour ozone concentrations at ozone monitors throughout southeastern Arizona and the Maricopa nonattainment area. On July 7, 2017, the monitors in the Maricopa nonattainment area experienced a dramatic rise in daily maximum 8-hour ozone concentrations concurrent with the arrival of smoke, ozone and ozone precursor emissions from the southeastern Arizona wildfires. Increases in ozone concentrations at the exceeding monitors range from a low of 6 ppb to a high of 33 ppb over the previous day, July 6, 2017, with a median increase of 25 ppb. Large jumps in ozone concentrations on July 7, 2017 were also observed at Pinal County and Pima County monitors to the southeast of the Maricopa nonattainment area as wildfire emissions impacted these areas as well, with a median increase of 10 ppb over July 6, 2017. Located on the border of Pinal and Pima County, the Pinal Air Park monitor recorded an exceedance of the 2008 ozone standard with an ozone concentration of 0.076 ppm, a 19 ppb increase over the prior day. These regional increases in ozone concentrations suggest the impact of a regional event across southeastern Arizona, as opposed to a typical nonattainment area exceedance day which only impacts monitors in the Maricopa nonattainment area. The regional increases in ozone concentrations in conjunction with the influx of smoke, ozone and ozone precursor emissions from the wildfires as seen in the satellite photos provide additional evidence that wildfire emissions were transported to the Maricopa nonattainment area monitors.

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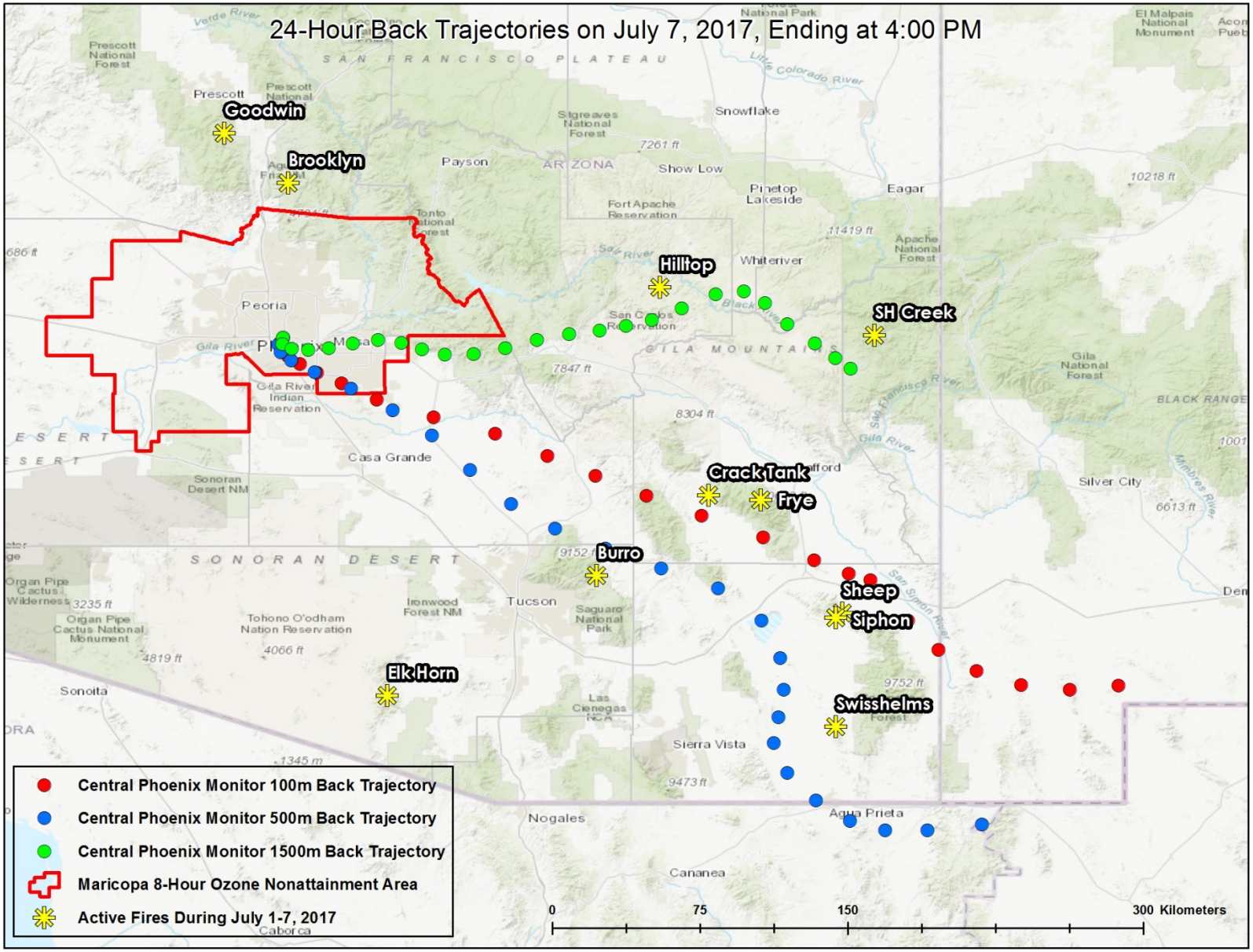

Figure 3-10. Back trajectories for the Central Phoenix monitor.

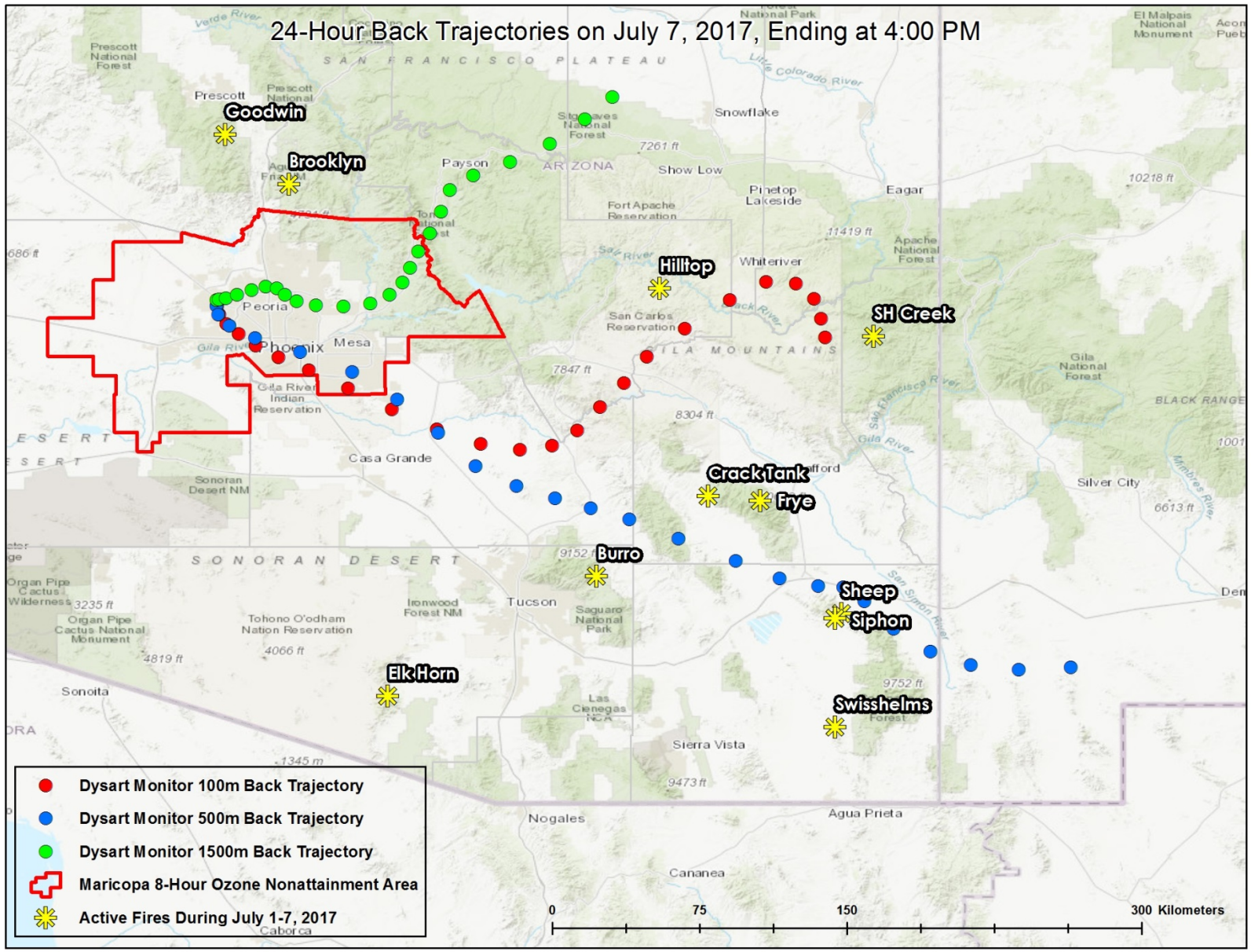

Figure 3-11. Back trajectories for the Dysart monitor.

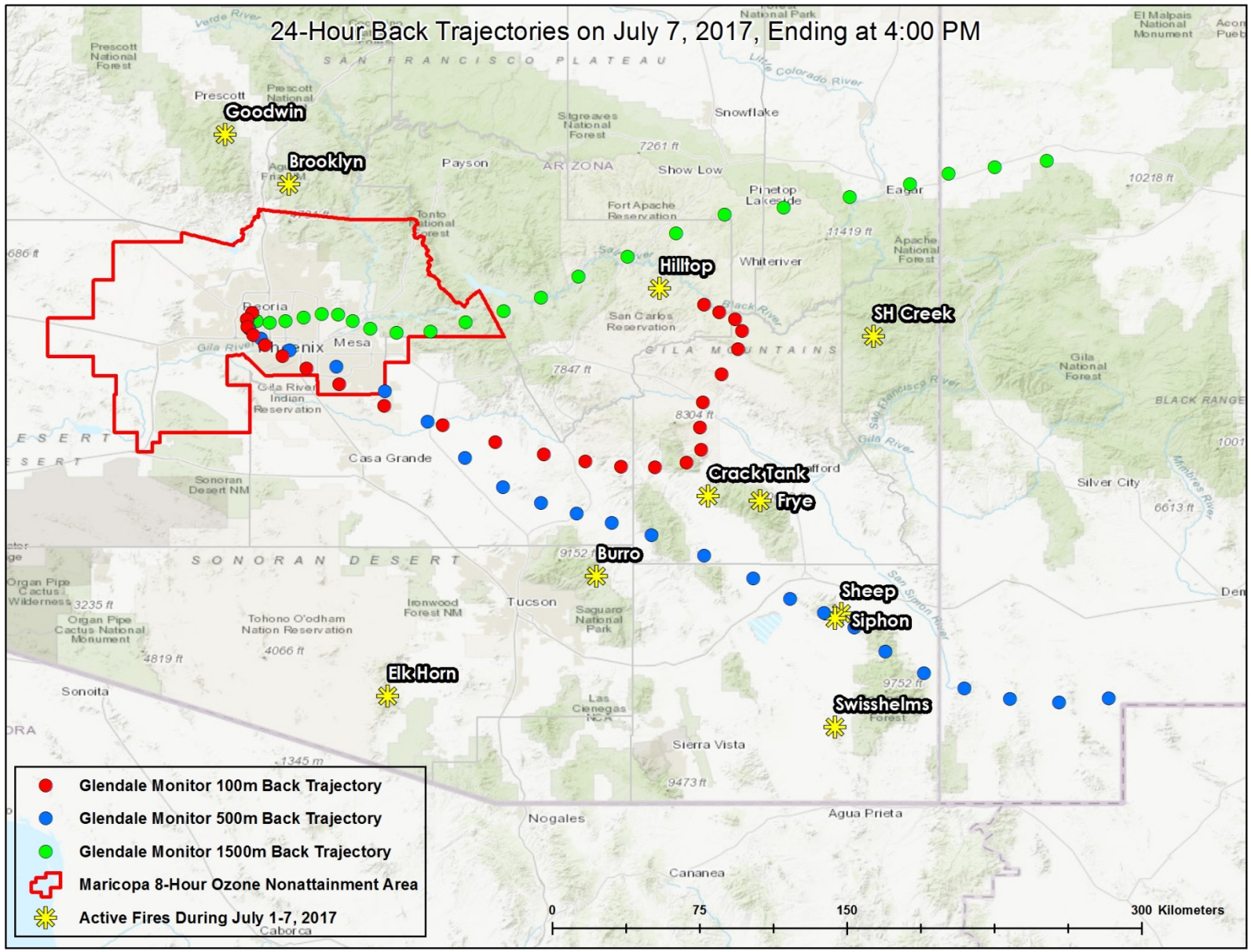

Figure 3-12. Back trajectories for the Glendale monitor.

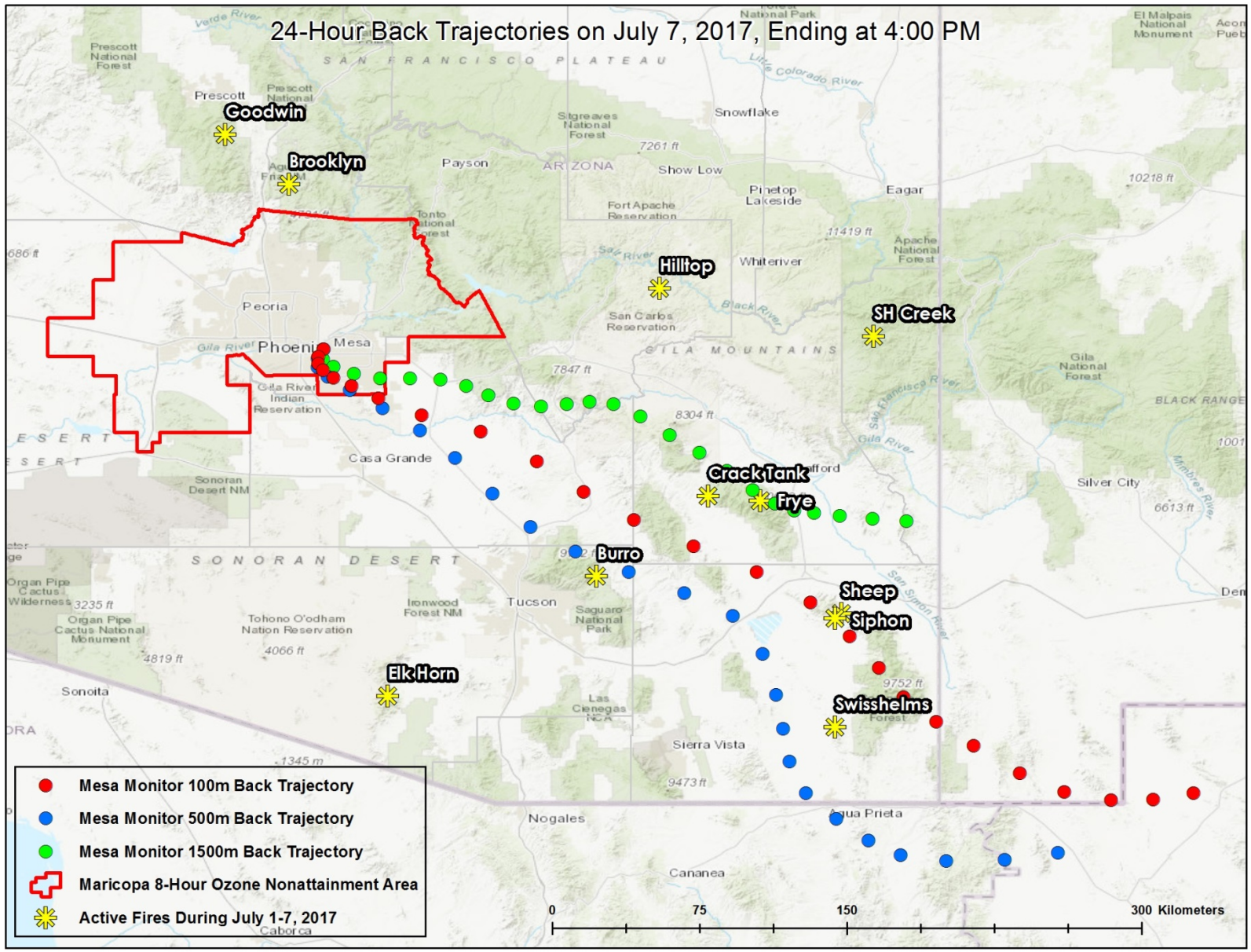

Figure 3-13. Back trajectories for the Mesa monitor.

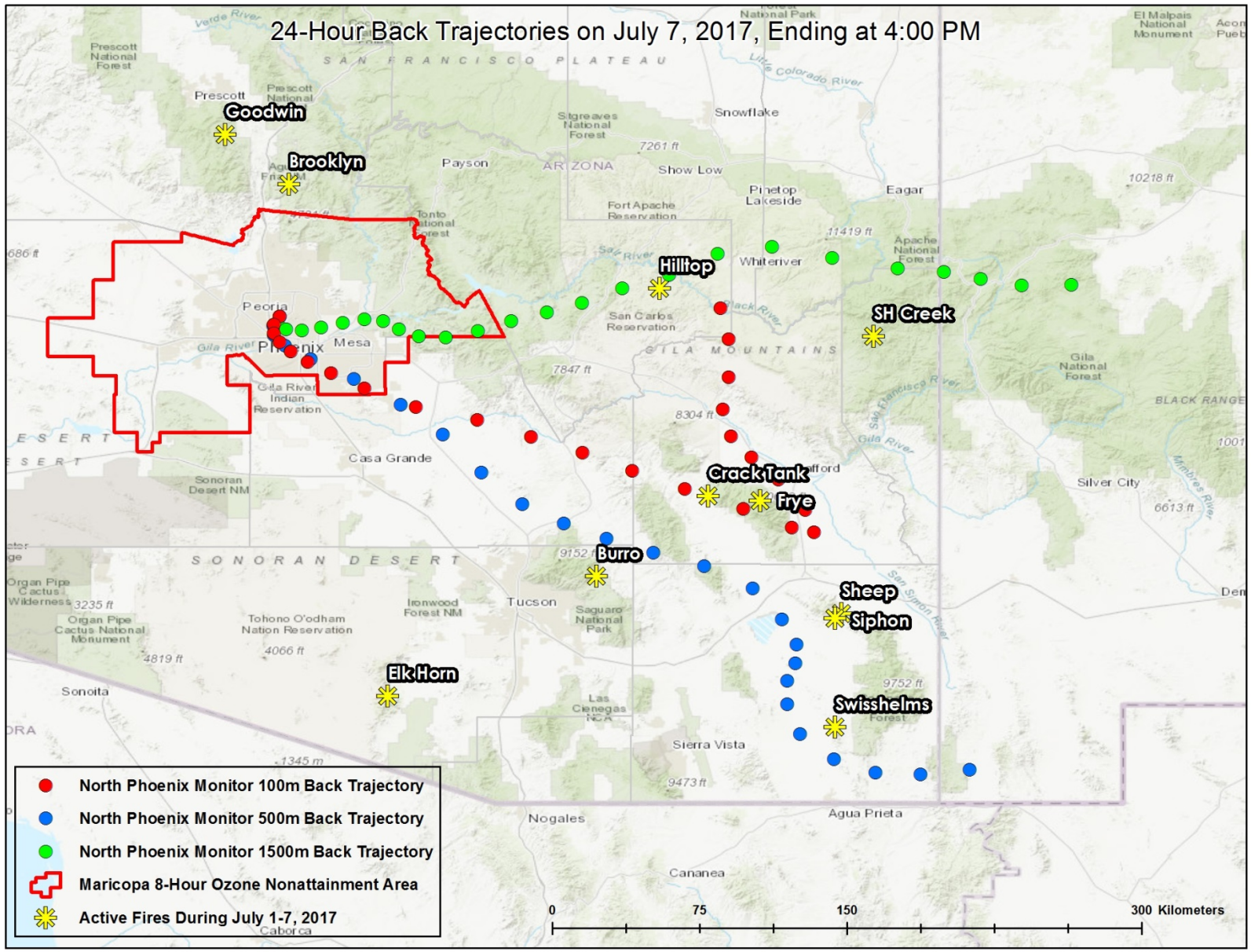

Figure 3-14. Back trajectories for the North Phoenix monitor.

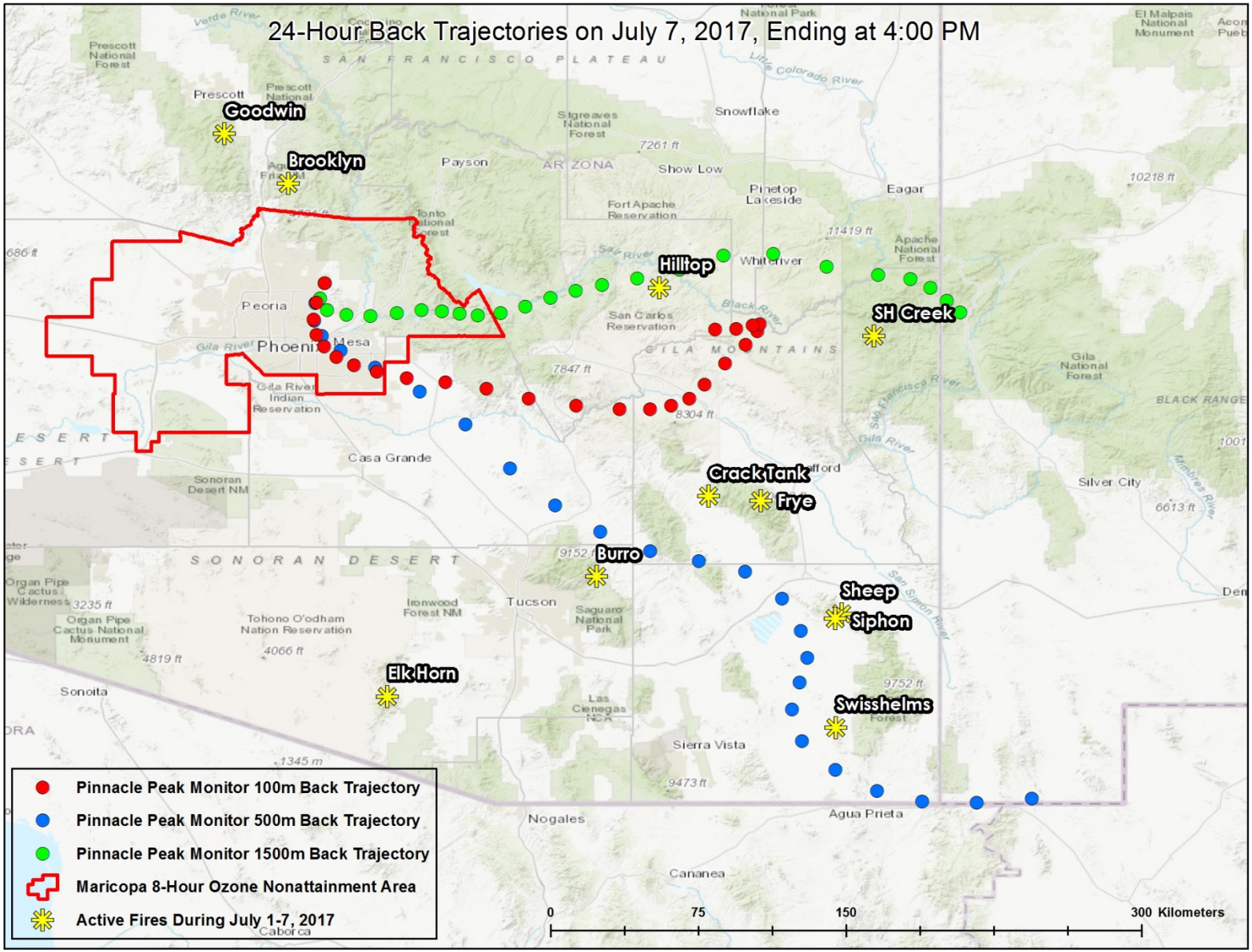

Figure 3-15. Back trajectories for the Pinnacle Peak monitor.

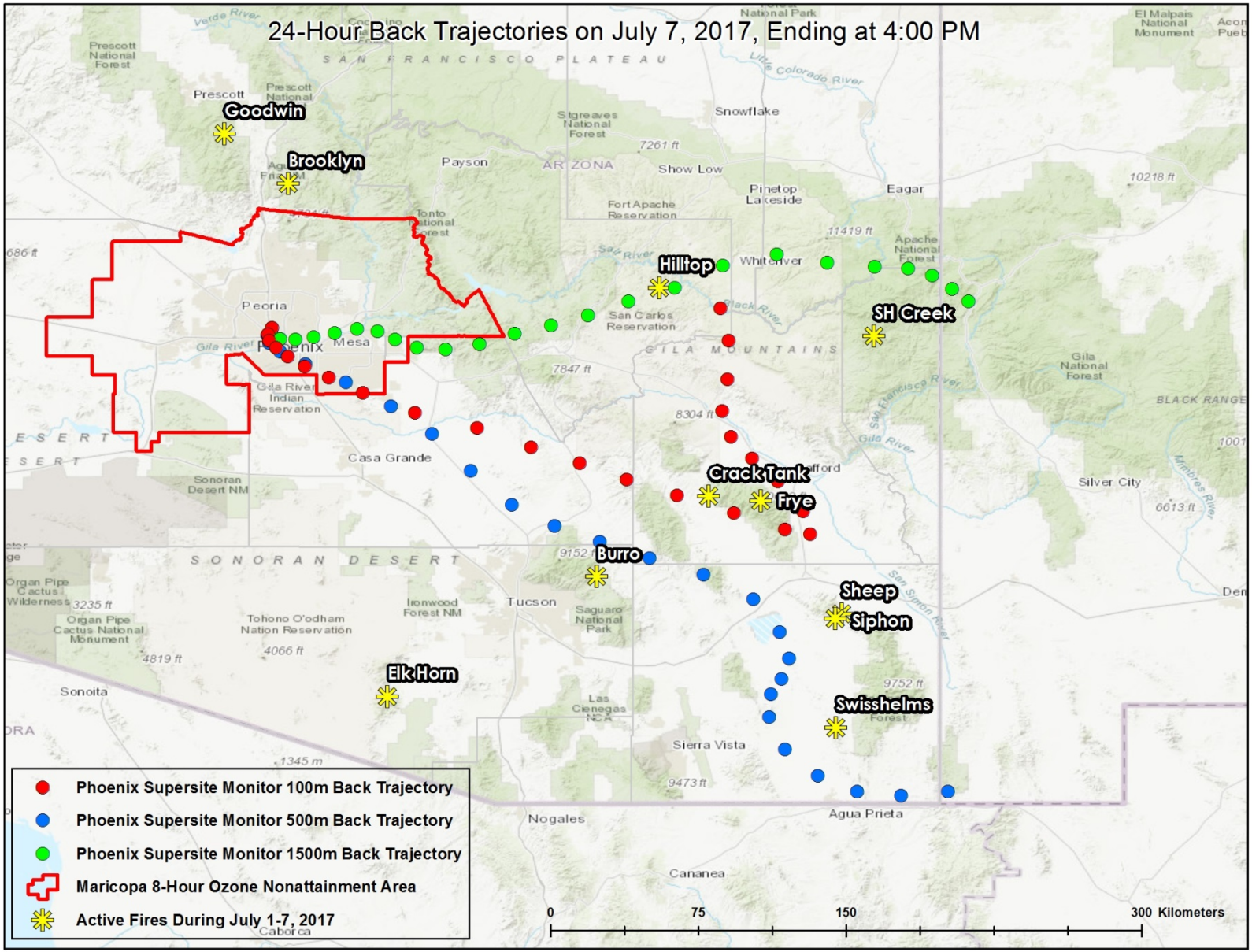

Figure 3-16. Back trajectories for the Phoenix Supersite monitor.

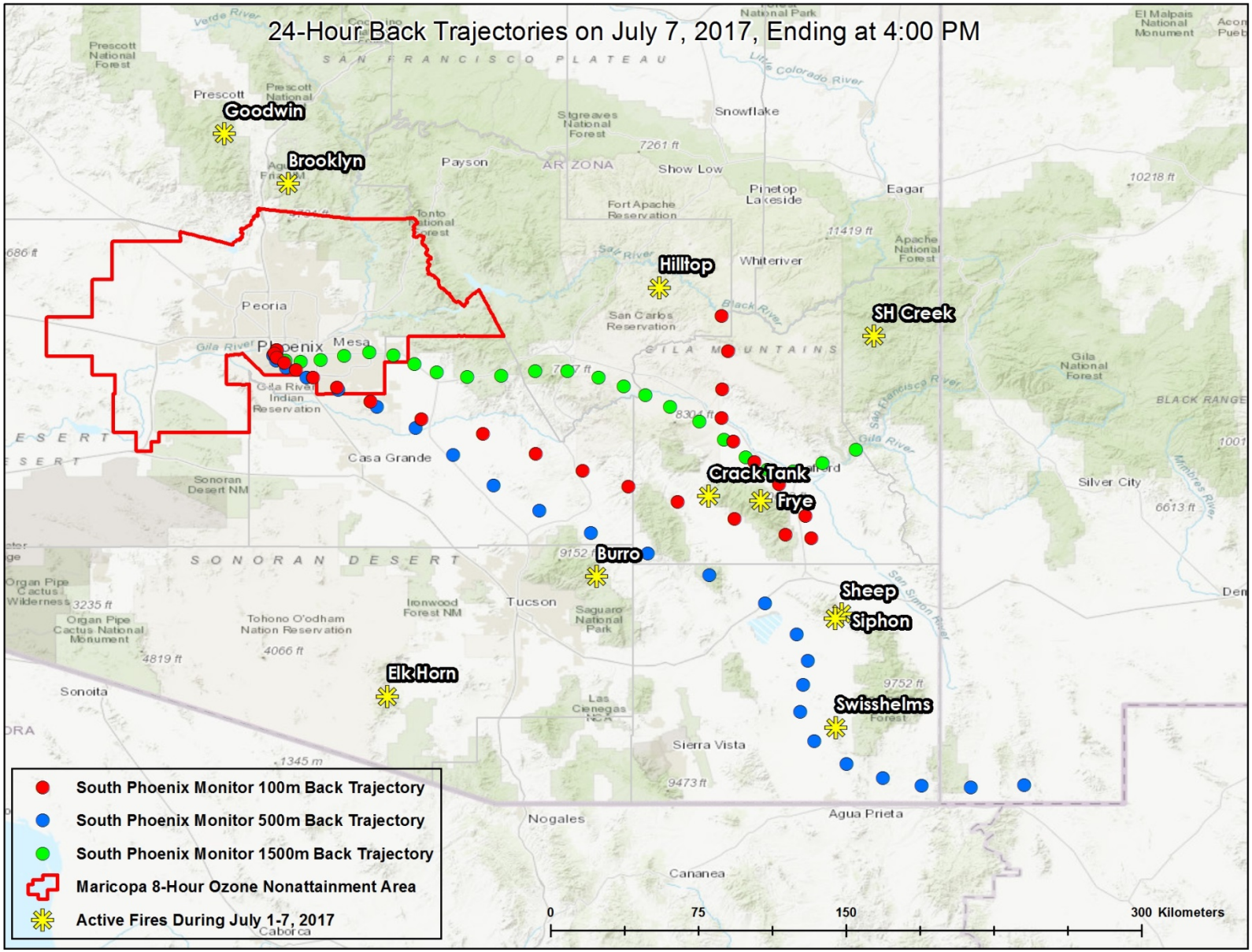

Figure 3-17. Back trajectories for the South Phoenix monitor.

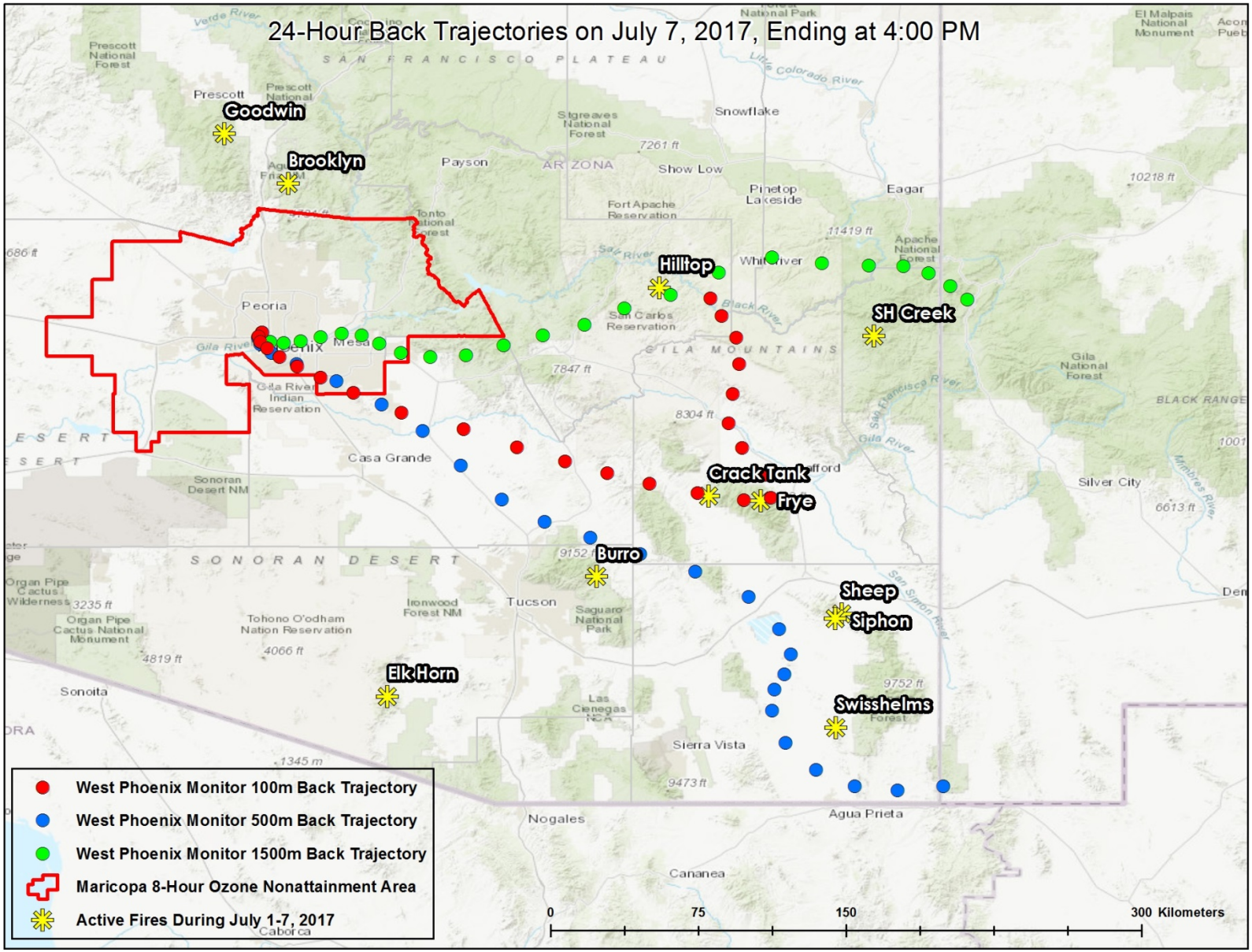

Figure 3-18. Back trajectories for the West Phoenix monitor.

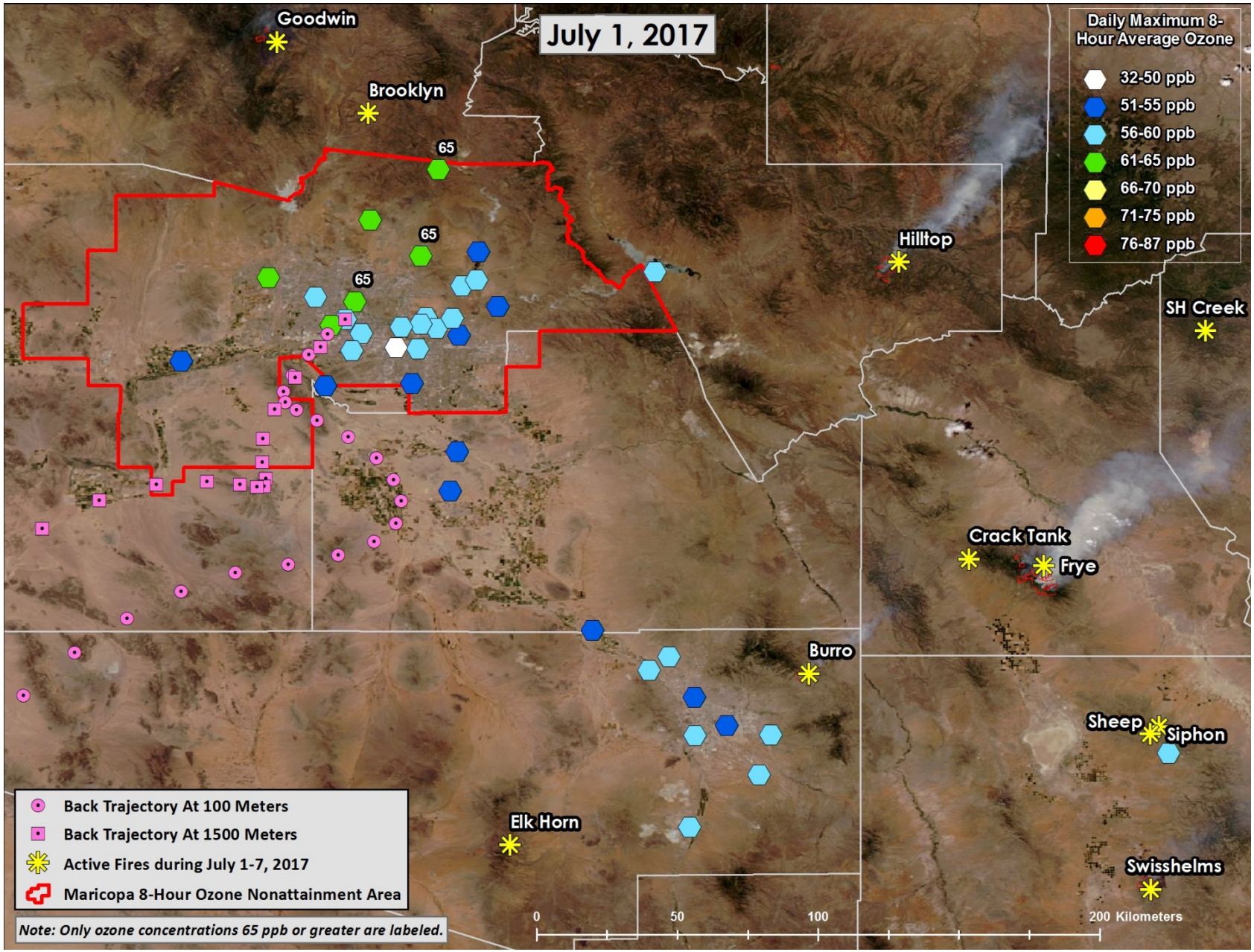

Figure 3-19. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 1, 2017 in southeastern Arizona.

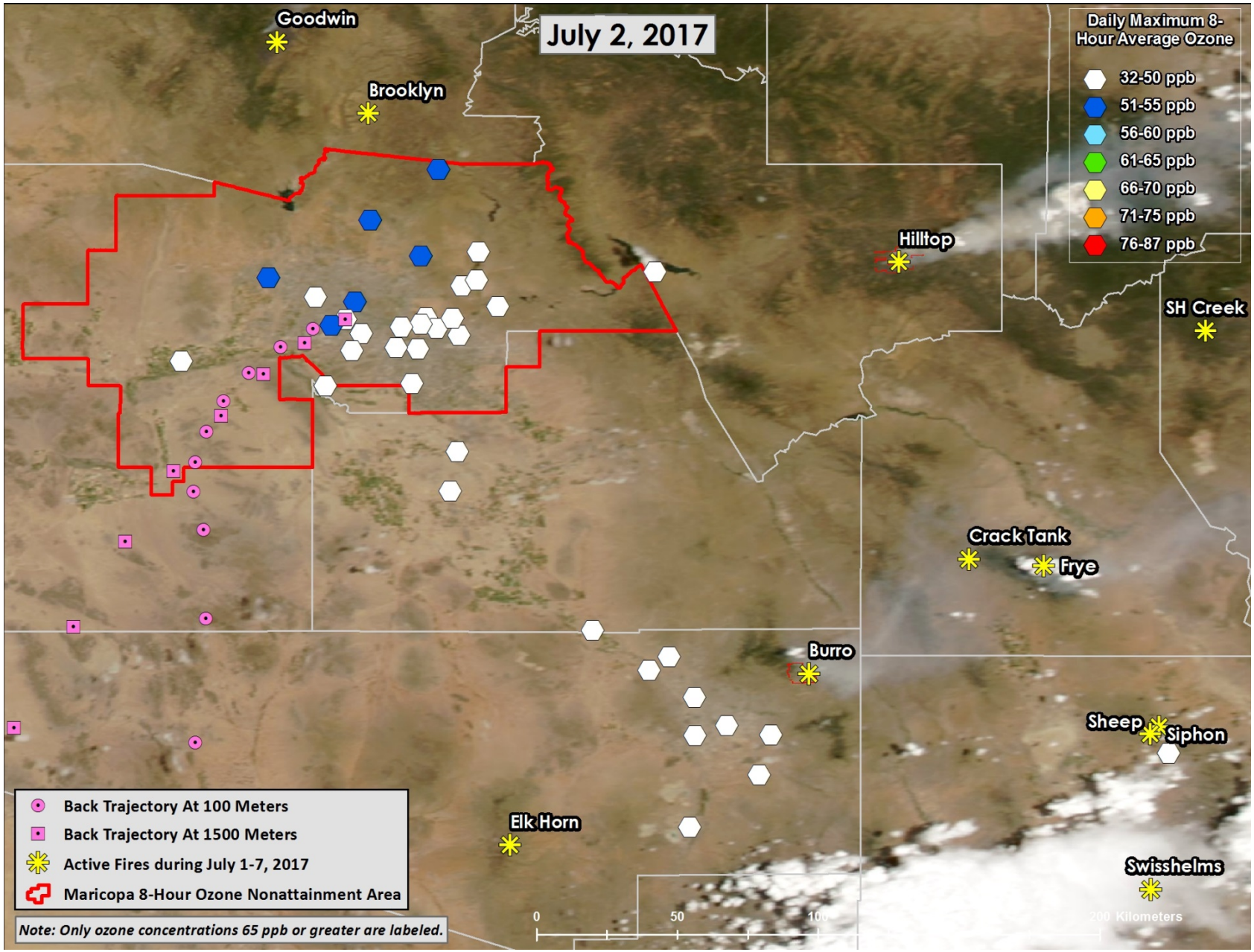

Figure 3-20. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 2, 2017 in southeastern Arizona.

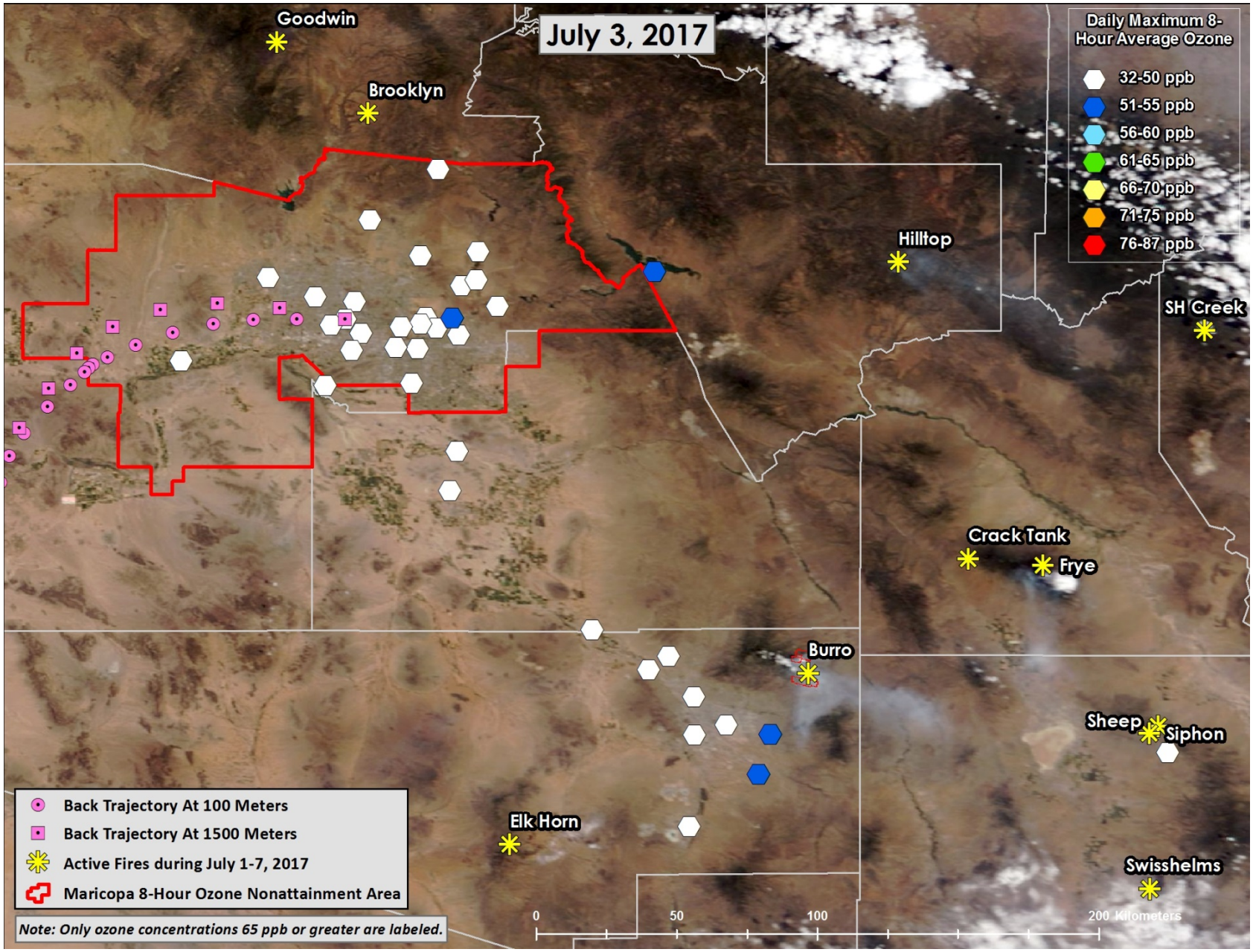

Figure 3-21. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 3, 2017 in southeastern Arizona.

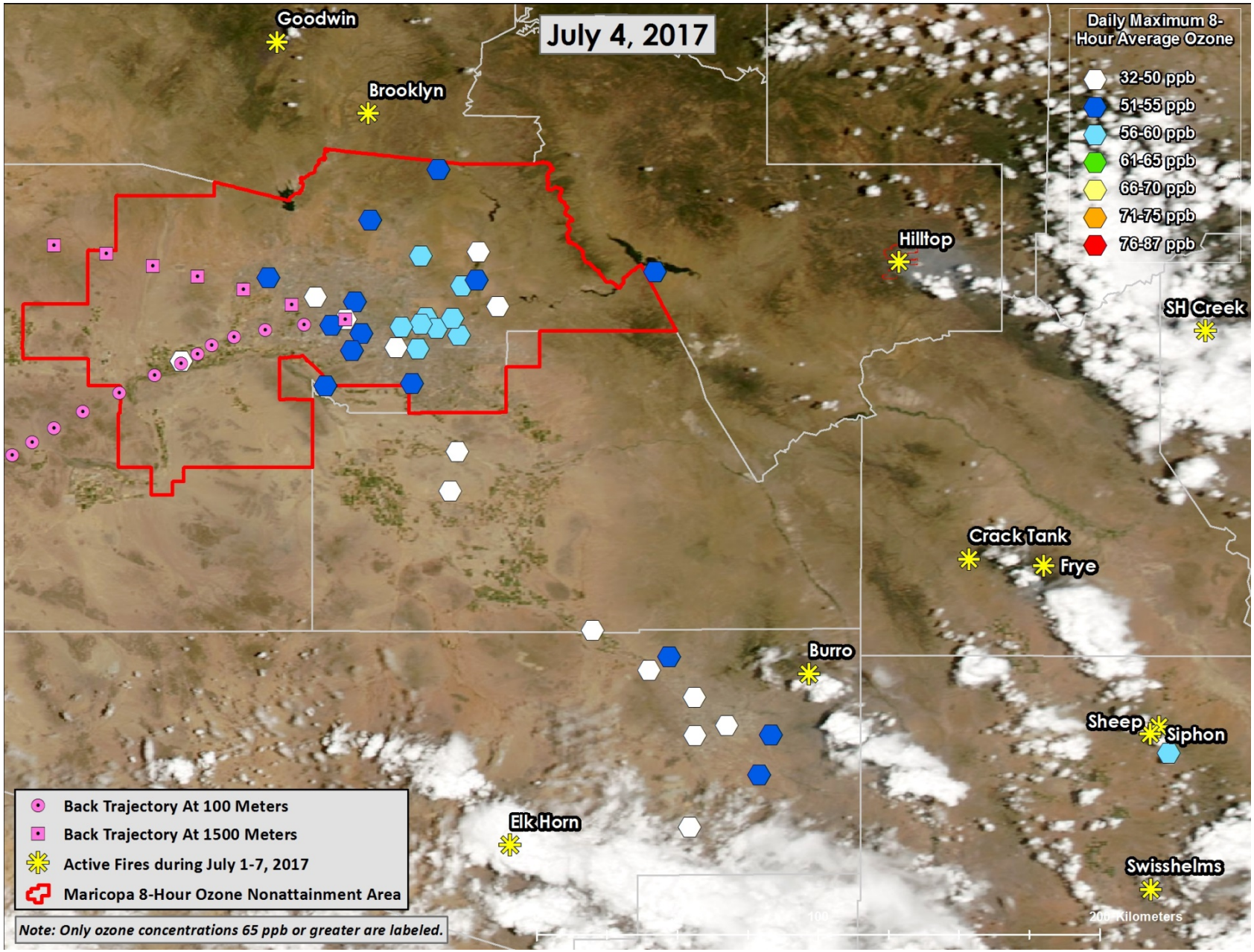

Figure 3-22. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 4, 2017 in southeastern Arizona.

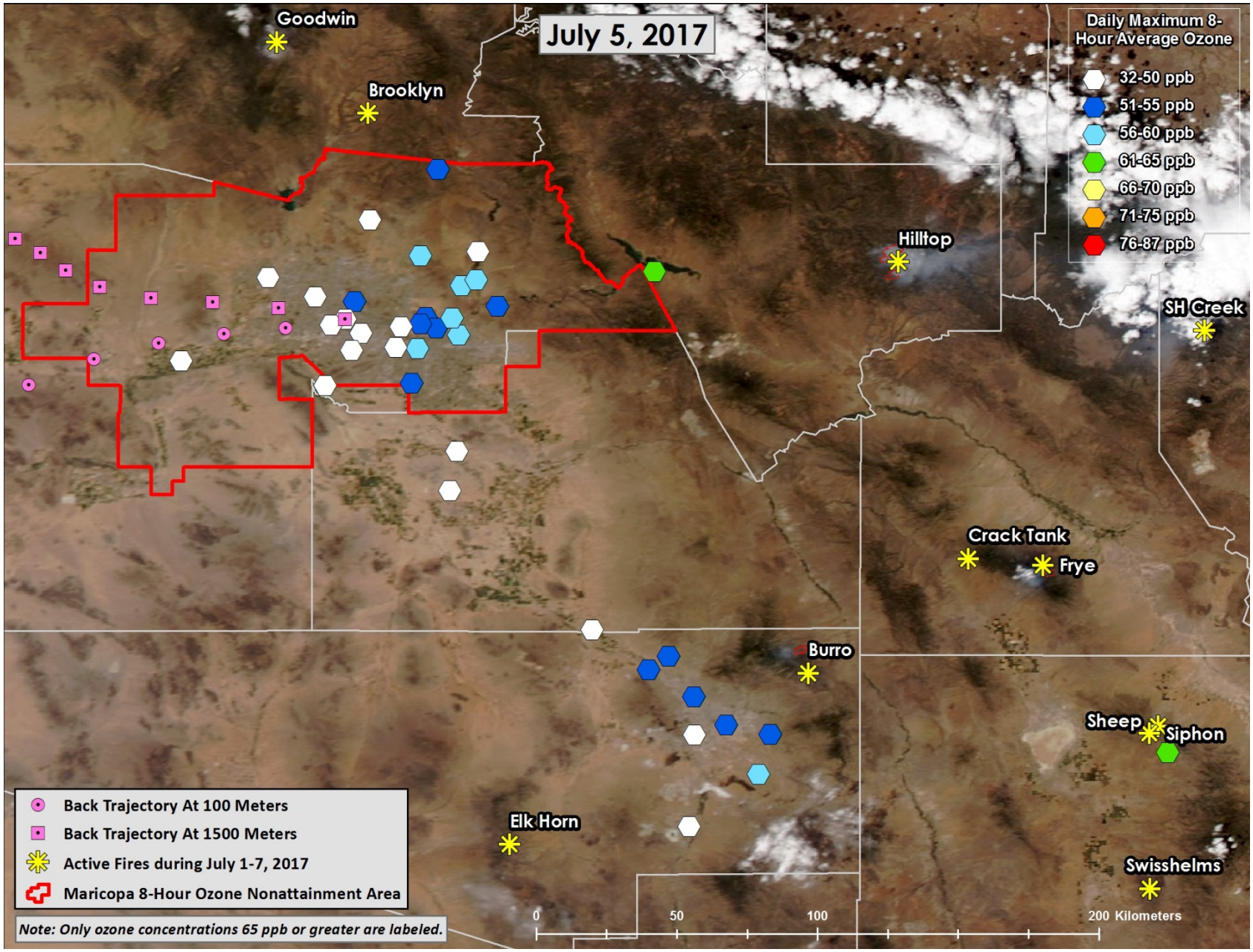

Figure 3-23. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 5, 2017 in southeastern Arizona.

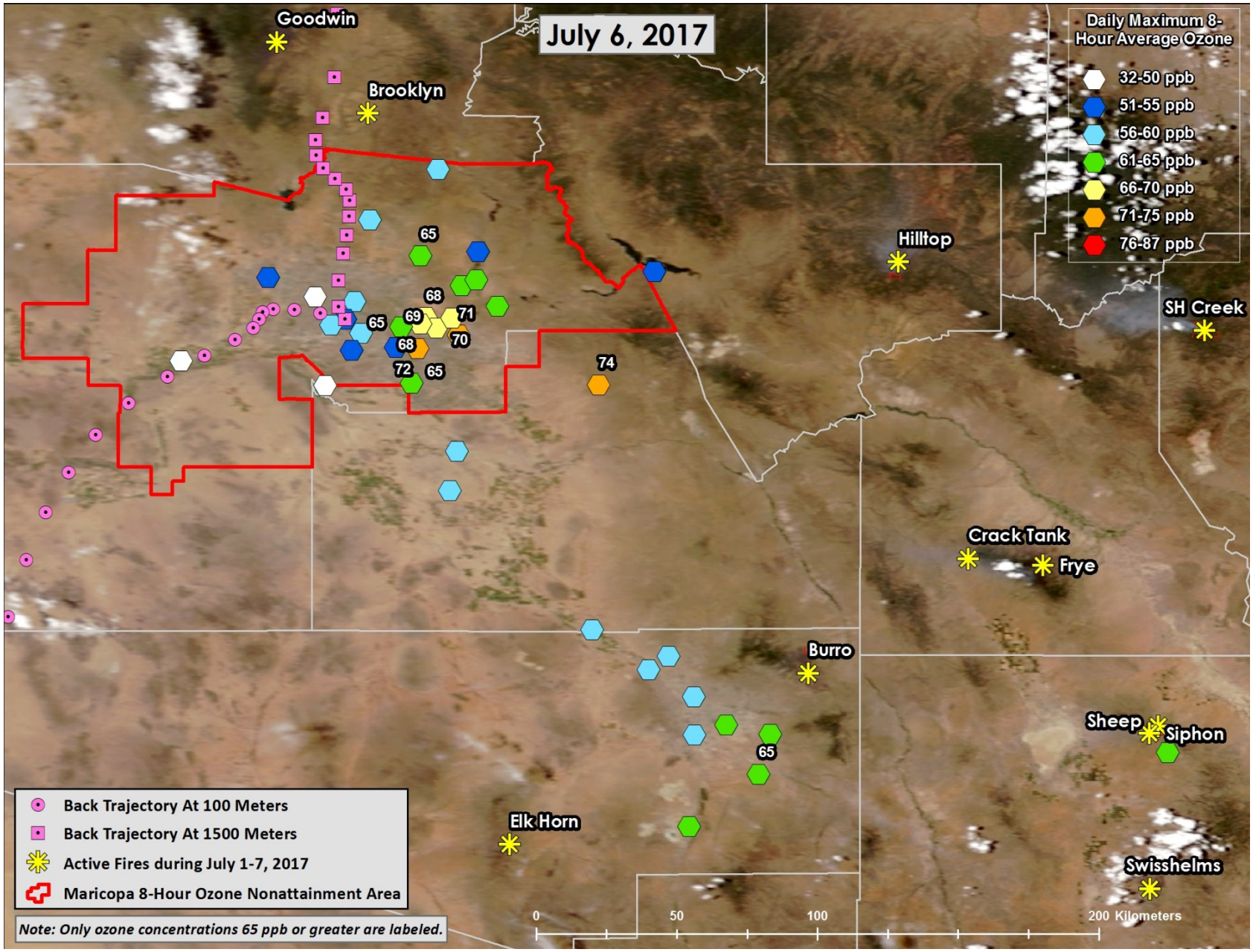

Figure 3-24. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 6, 2017 in southeastern Arizona.

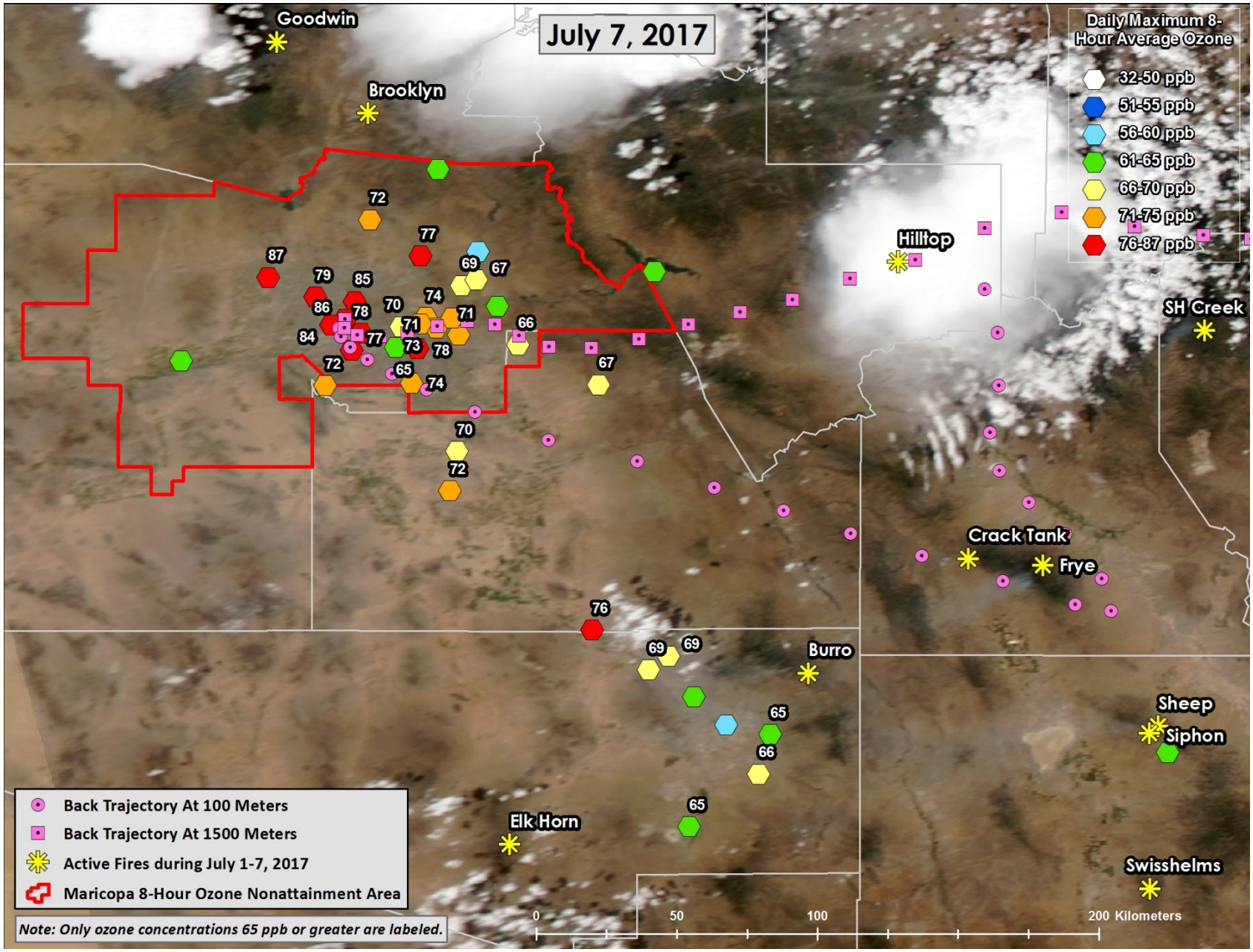

Figure 3-25. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 7, 2017 in southeastern Arizona.

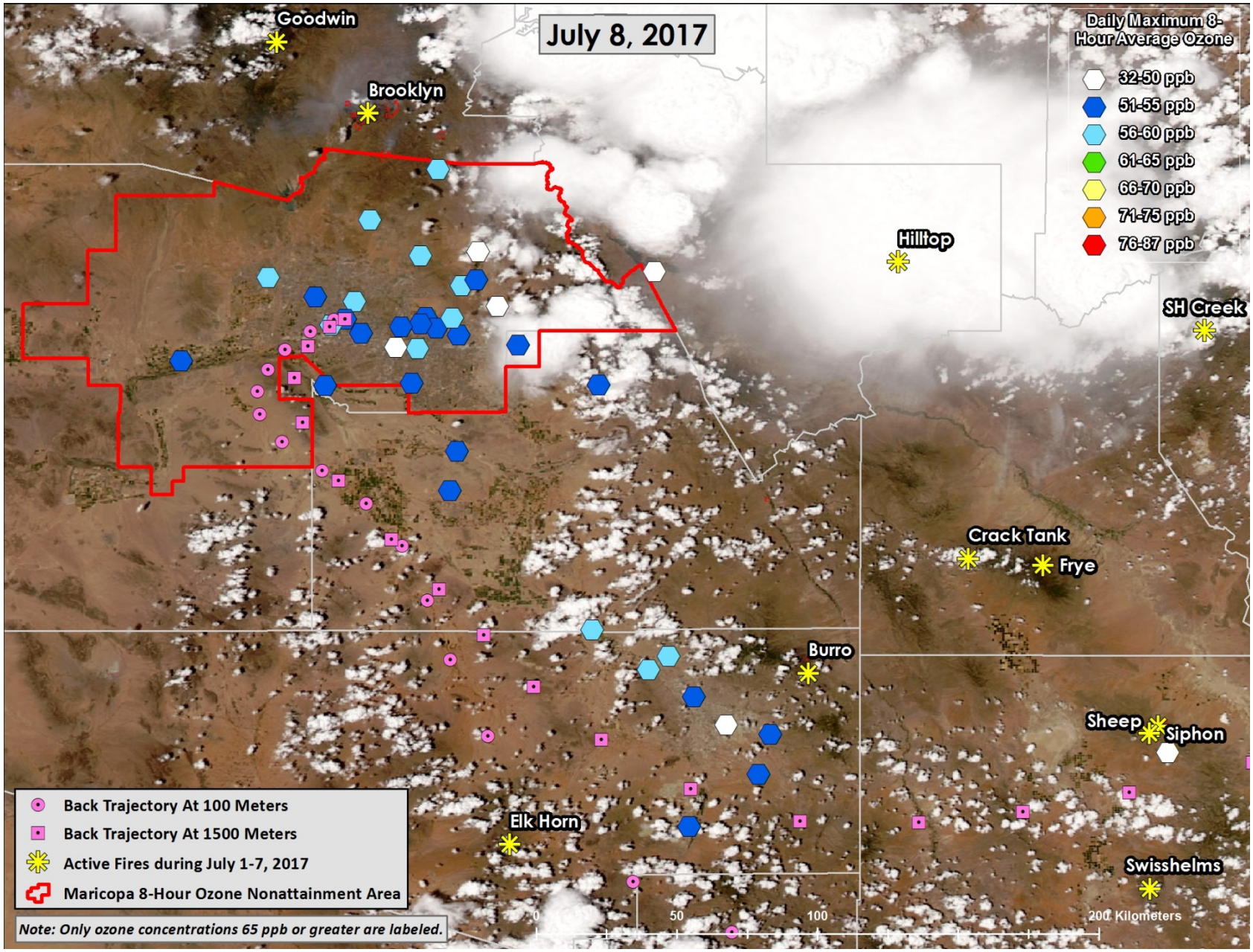

Figure 3-26. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 8, 2017 in southeastern Arizona.

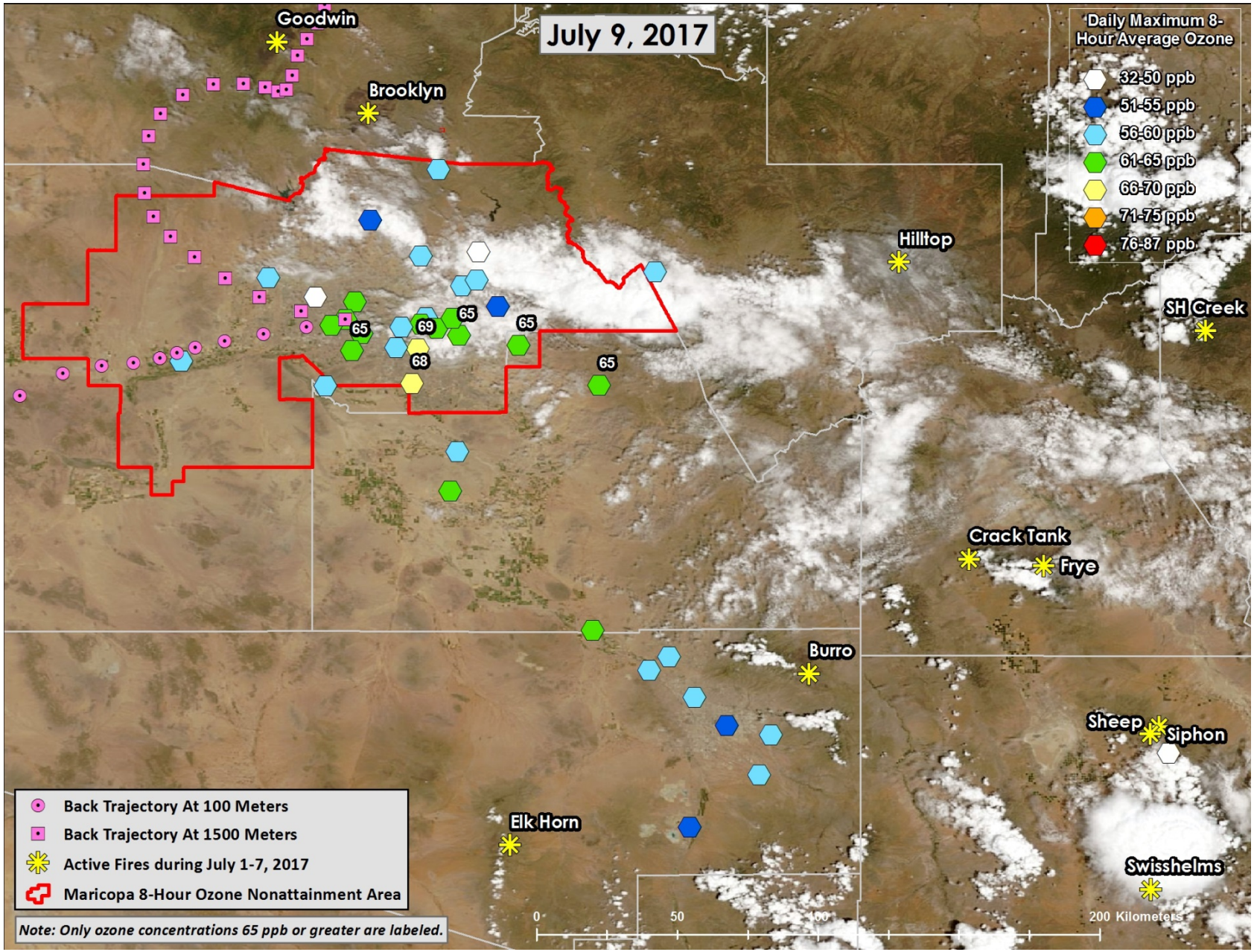

Figure 3-27. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 9, 2017 in southeastern Arizona.

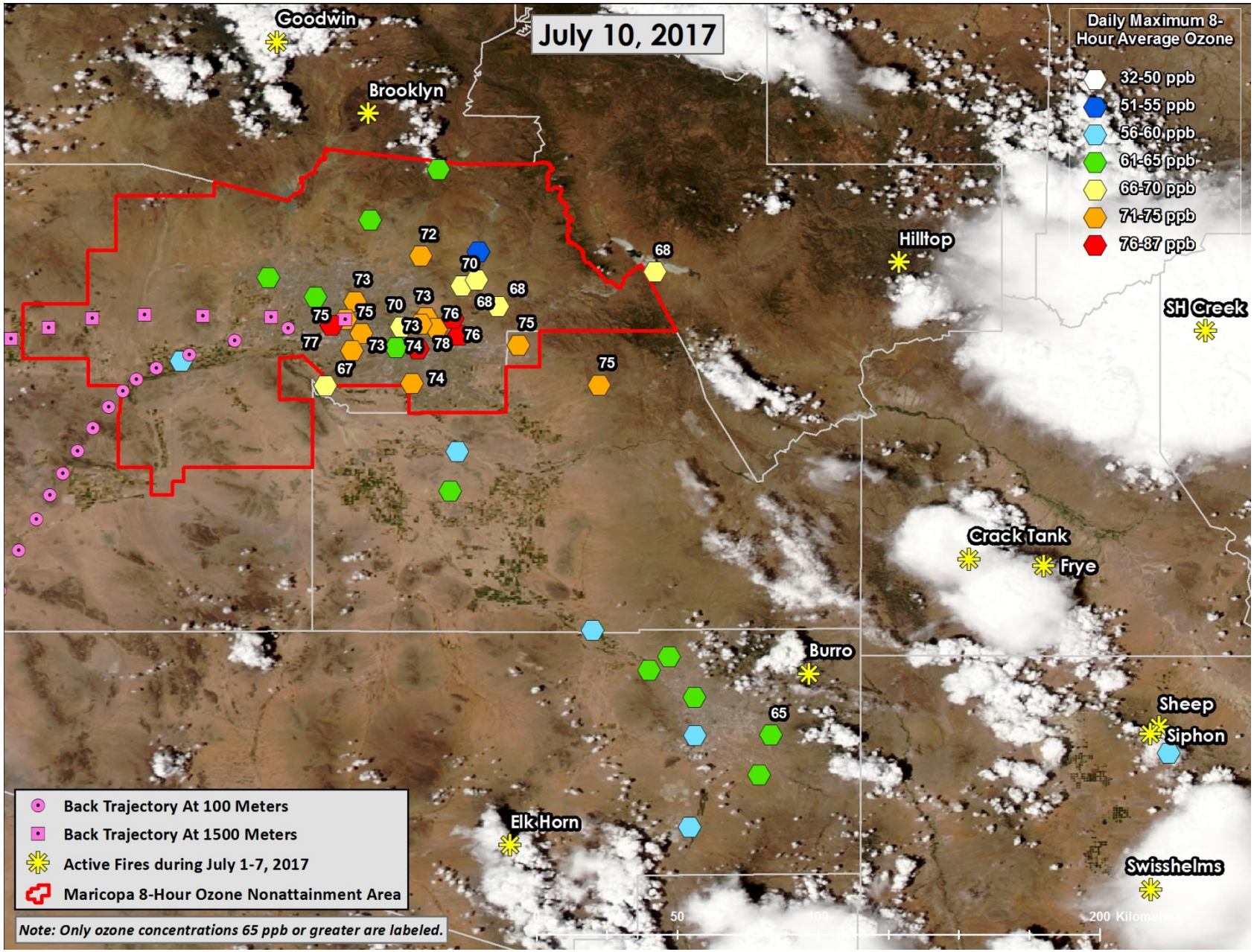

Figure 3-28. Satellite photos of wildfire and maximum daily 8-hour ozone concentrations on July 10, 2017 in southeastern Arizona.

Evidence that the Wildfire Emissions Affected the Monitors

Smoke Impacts as Seen Through Visibility Photos

Evidence that transported wildfire emissions affected the exceeding Maricopa nonattainment area monitors is available through the examination of ground-level visibility camera photos. Two of the visibility cameras operated by the Arizona Department of Environmental Quality include the Camelback Mountain camera and the South Mountain camera. This Camelback Mountain camera is situated in the urban core of the Maricopa nonattainment area and looks out to the northeast. The South Mountain Camera is situated in urban north-central Phoenix and looks out to the south.

Both visibility cameras show smoke impacts in the form of reduced visibility in the Maricopa nonattainment area during the morning, noontime, and afternoon on July 7, 2017, when compared to the prior and following day at the same times. Figures 3–29 through 3–31 show the reduced visibility on July 7, 2017 in the Maricopa nonattainment area as seen at 9:00 am, 12:00 pm and 4:30 pm at the Camelback Mountain camera, and Figures 3–32 through 3–34 show the reduced visibility on July 7, 2017 in the Maricopa nonattainment area as seen at 9:00 am, 12:00 pm and 4:30 pm at the South Mountain camera.

Figure 3-29. Visibility reduction at 9:00 am on July 7, 2017 as viewed from the Camelback Mountain cameras.

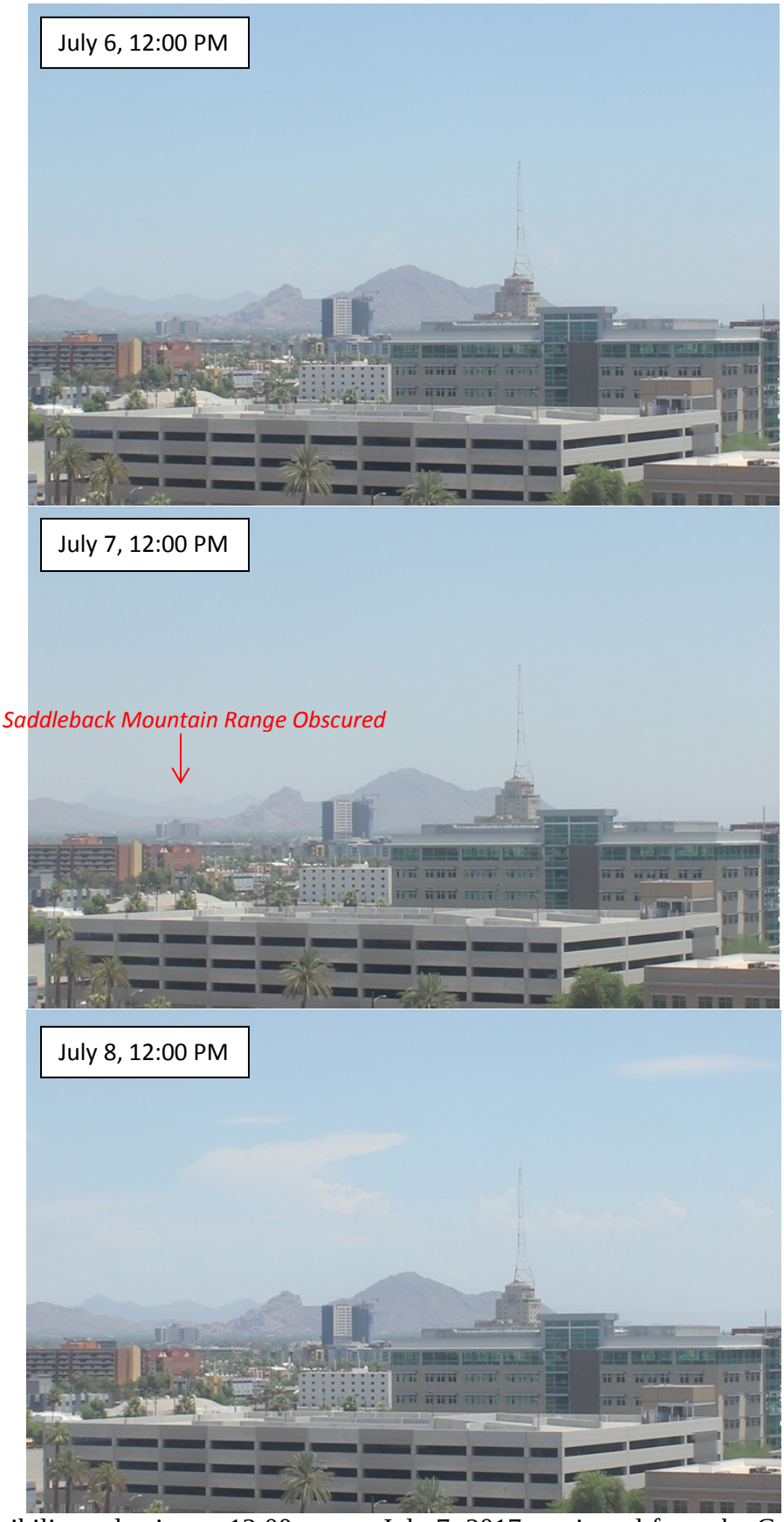

Figure 3-30. Visibility reduction at 12:00 pm on July 7, 2017 as viewed from the Camelback Mountain cameras.

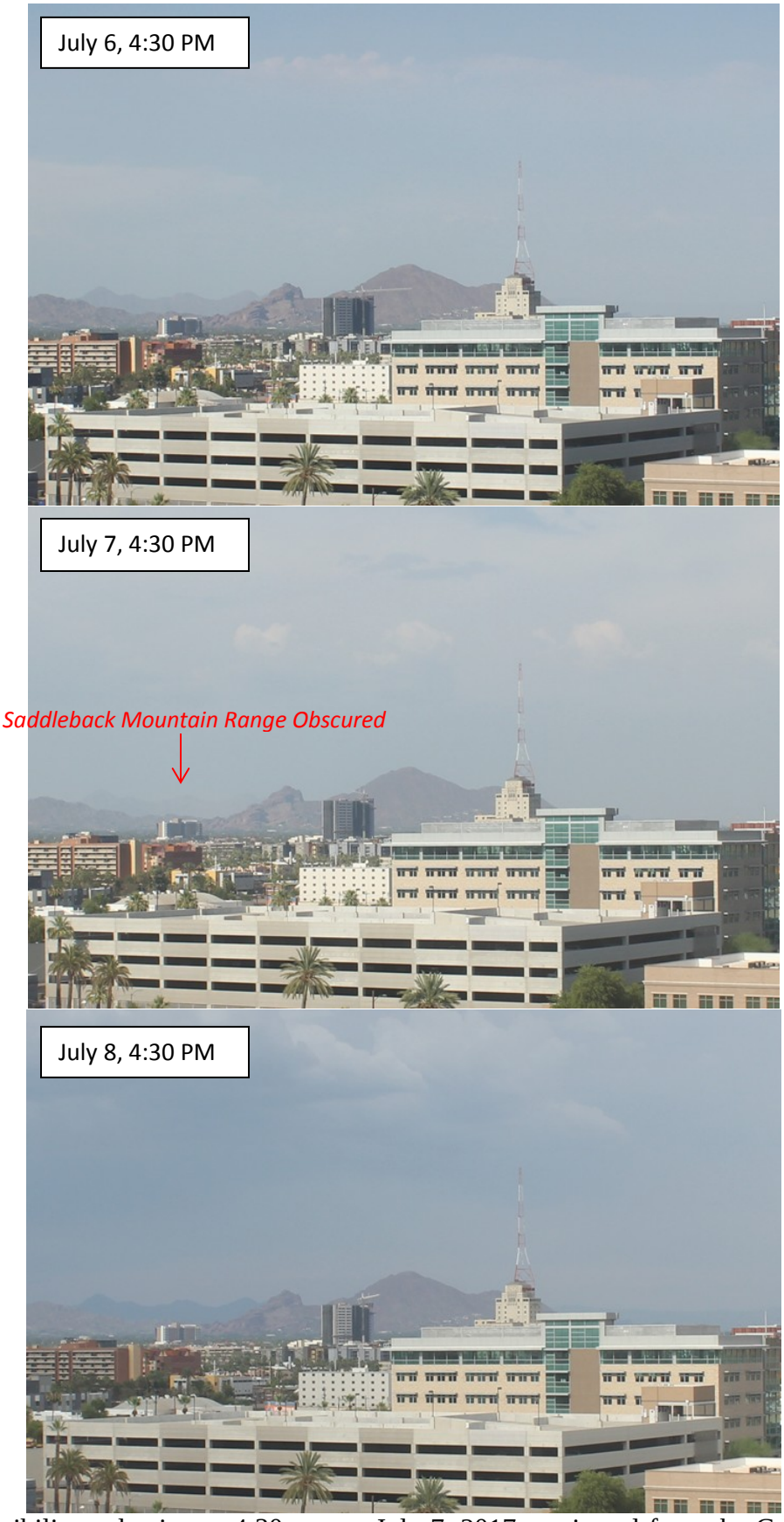

Figure 3-31. Visibility reduction at 4:30 pm on July 7, 2017 as viewed from the Camelback Mountain cameras.

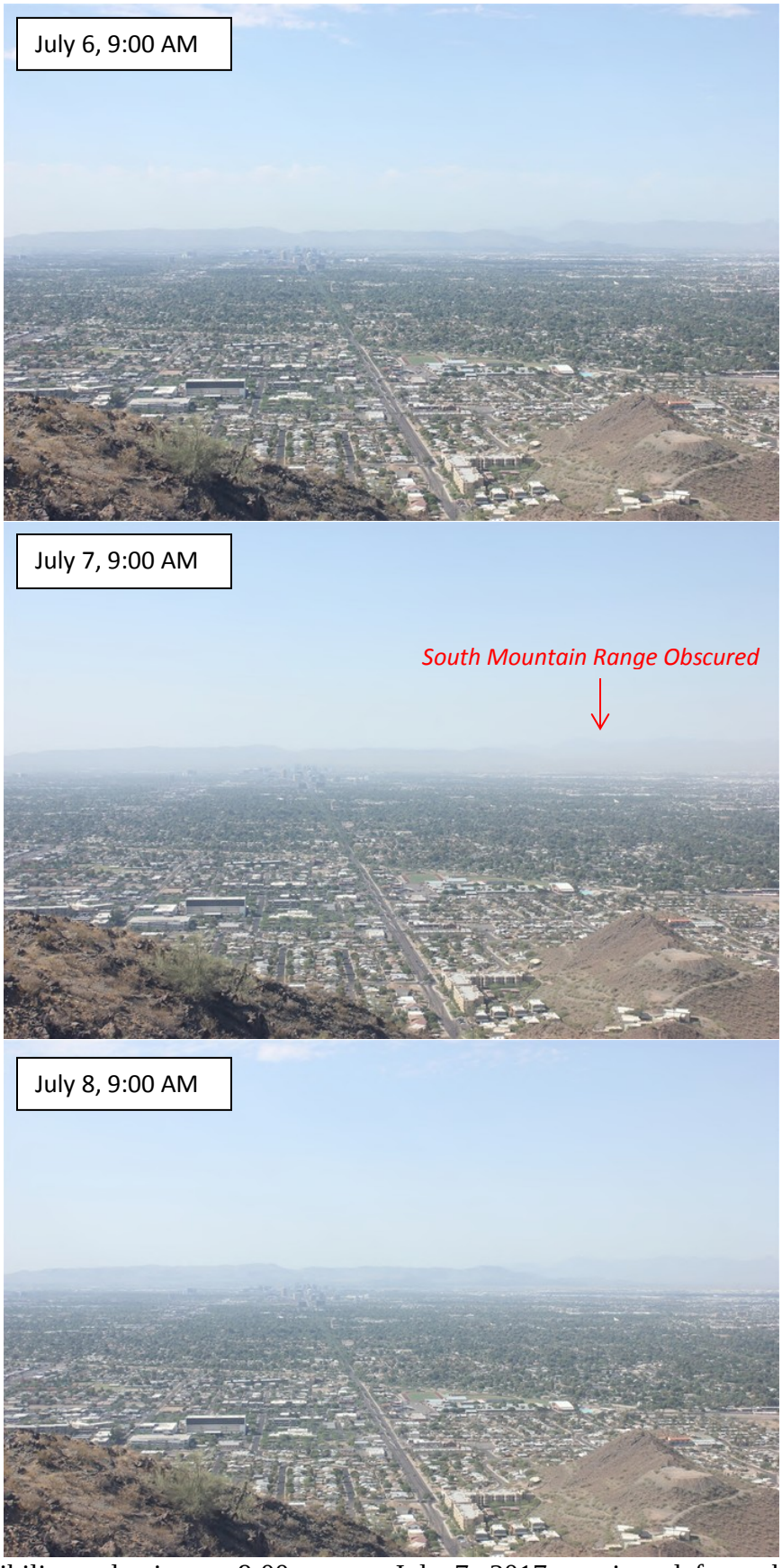

Figure 3-32. Visibility reduction at 9:00 am on July 7, 2017 as viewed from the South Mountain cameras.

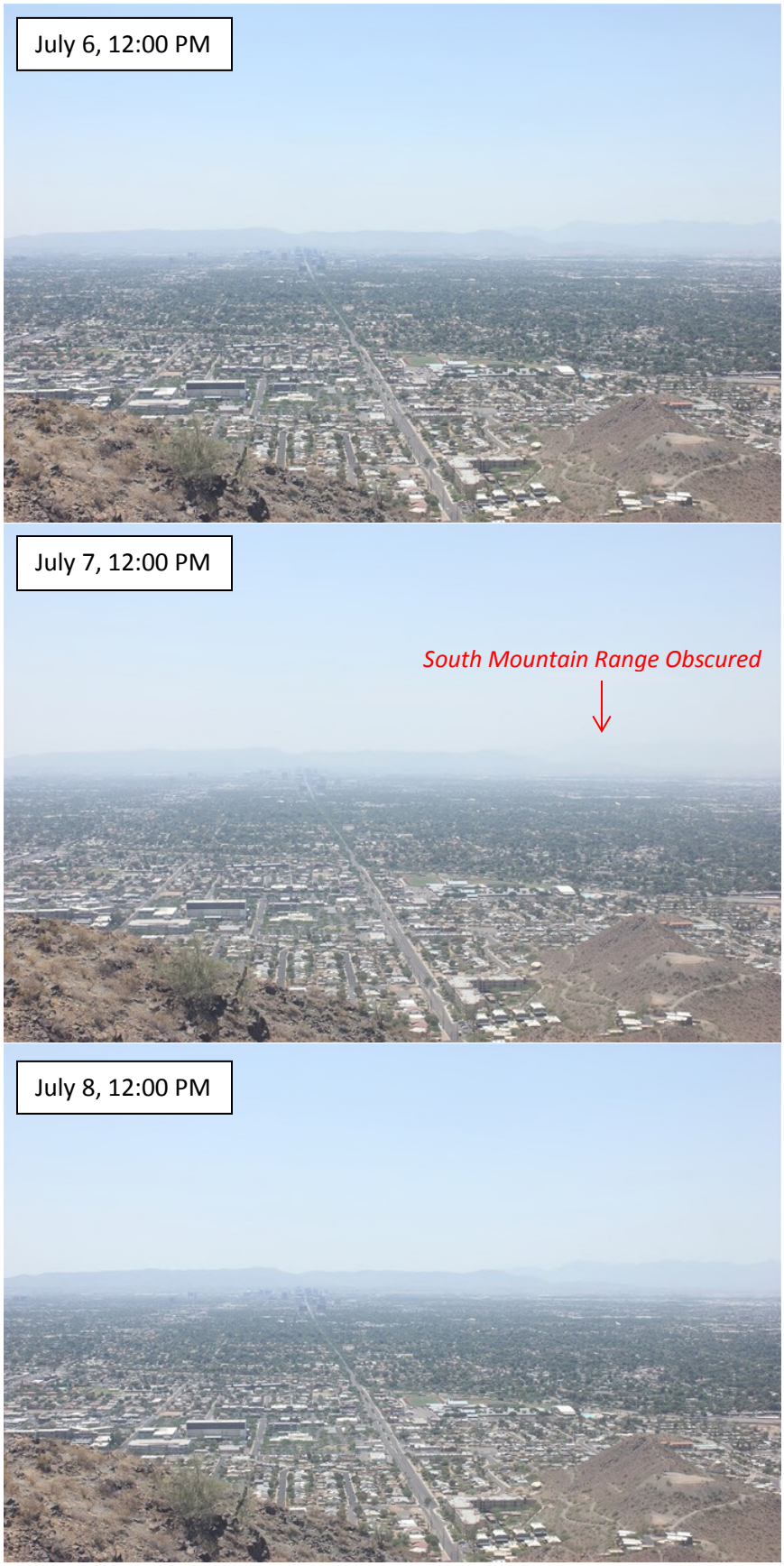

Figure 3-33. Visibility reduction at 12:00 pm on July 7, 2017 as viewed from the South Mountain cameras.

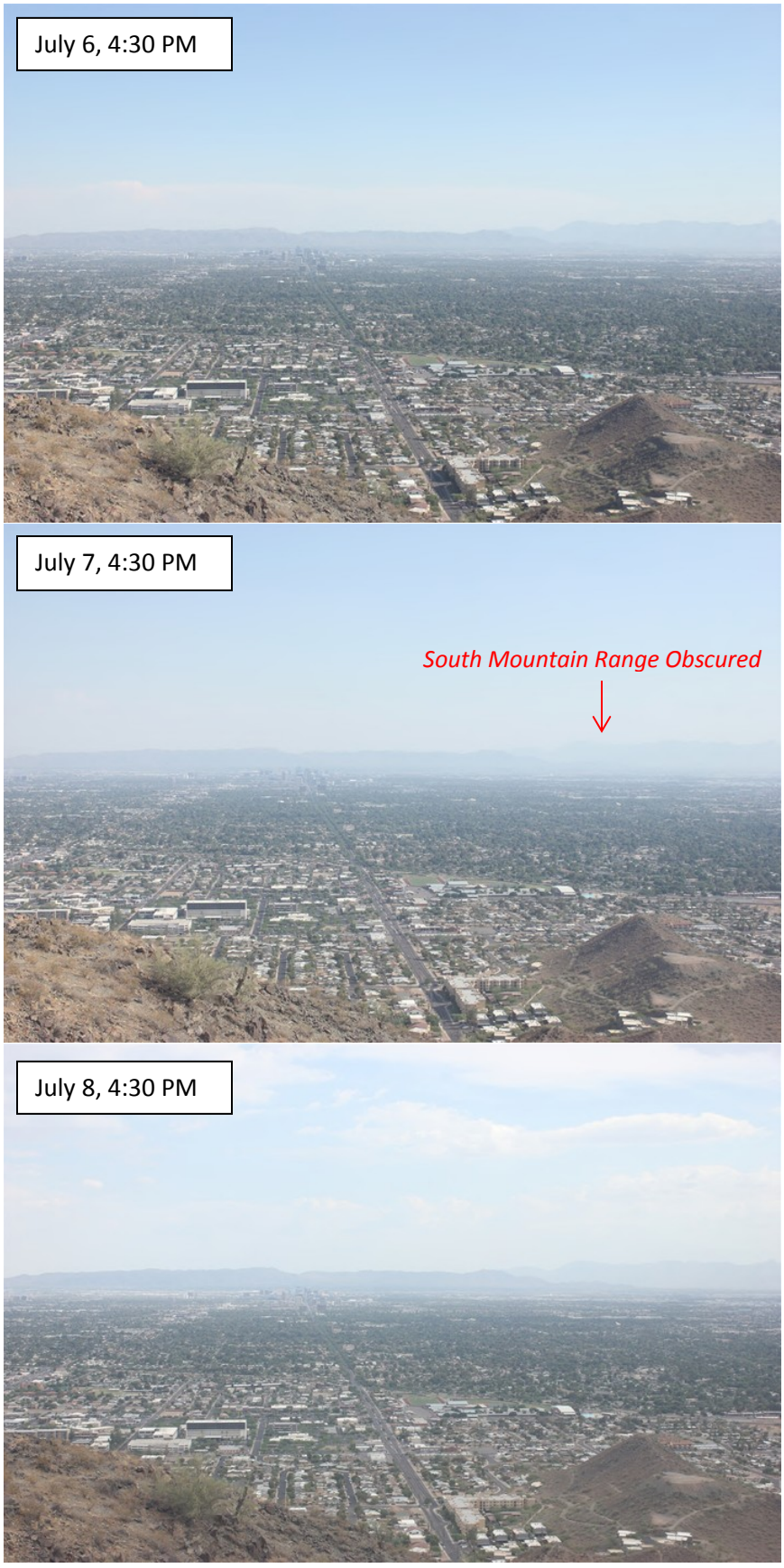

Figure 3-34. Visibility reduction at 4:30 pm on July 7, 2017 as viewed from the South Mountain cameras.

Non-Typical Diurnal Concentrations of Ozone, NO_2, $PM_{2.5}$, and CO

In addition to the observed visibility impairments shown above, monitored diurnal concentrations of ozone, NO_2, $PM_{2.5}$ and CO at the exceeding nonattainment area monitors show impacts from the wildfire emissions. The Wildfire Guidance states that when evaluating pollutant concentrations for wildfire impacts at the monitor "the air agency should distinguish the difference in non-event pollutant behavior (e.g., concentration, timing, ratios, and/or spatial patterns) from the behavior during the event impact to more clearly show that the emissions from the fire(s) affected the monitor(s)."

For this subsection, diurnal pollutant concentrations of ozone, NO_2, $PM_{2.5}$ and CO at the West Phoenix monitor on July 7, 2017 are compared to the 5-year (2013-2017) 5^{th}, 50^{th} and 95^{th} percentile diurnal concentrations at the West Phoenix monitor in the month of July. The 5^{th}, 50^{th} and 95^{th} percentile concentrations were limited to the month of July in order to compare days with similar meteorology (e.g., high temperatures, monsoon impacts, etc.). The West Phoenix monitor was chosen for this analysis as it had one of the highest exceeding ozone concentrations on July 7, 2017 in the nonattainment area (0.084 ppm); and it is one of two monitors that record all four pollutants (the other site that records all four pollutants is the Phoenix Supersite, however this site is missing diurnal CO data for all hours on July 6, 2017 and for 11 hours on July 7, 2017).

Additionally, Appendix F contains diurnal pollutant concentrations figures for ozone, nitrogen dioxide (NO_2), particulate matter less than 2.5 micrometers ($PM_{2.5}$) and carbon monoxide (CO) where available at the nine monitors which exceeded the 2008 ozone standard (0.075 ppm) in the Maricopa eight-hour ozone nonattainment area on July 6-8. 2017. Not all monitors collect data on all four pollutants. The nine monitors and the pollutant data they monitor are listed below:

Central Phoenix (04-013-3002)	CO, NO_2 and Ozone
Dysart (04-013-4010)	Ozone
Glendale (04-013-2001)	Ozone and $PM_{2.5}$
Mesa (04-013-1003)	CO, Ozone and $PM_{2.5}$
North Phoenix (04-013-1004)	CO, Ozone and $PM_{2.5}$
Phoenix Supersite (04-013-9997)	CO, NO_2, Ozone and $PM_{2.5}$
Pinnacle Peak (04-013-2005)	Ozone
South Phoenix (04-013-4003)	CO, Ozone and $PM_{2.5}$
West Phoenix (04-013-0019)	CO, NO_2, Ozone and $PM_{2.5}$

The diurnal concentrations on July 6-8, 2017 at each monitoring site in Appendix F are presented alongside the 5^{th}, 50^{th} and 95^{th} percentile concentrations from two monitoring-site specific data sources. The first data source calculates the percentiles based upon data from the monitoring site for the month of July only in years 2013-2017 (designed to limit the comparison to days with similar meteorology). The second data source calculates the percentiles based upon data from the monitoring site for the months of May-August in years 2013-2017 (designed to look at the months when over 90% of the ozone exceedances occur). In calculating the percentiles, the diurnal monitoring data from the two data sources was also grouped by workdays (Monday-Friday) and weekend days (Saturday-Sunday) to account for the reduction in anthropogenic emissions of ozone precursors that occurs on weekend days as compared to workdays in the Maricopa nonattainment area. Diurnal data presented in the main body of this demonstration is calculated using only monitoring data from the month of July in years 2013-2017. Additionally, in calculating the percentiles, the diurnal monitoring data is not grouped, but calculated individually for each day (i.e. the 5^{th} percentile values on July 7, 2017 (a Friday) at the West Phoenix

monitor are calculated using only diurnal concentrations from West Phoenix monitoring data for Fridays in July, 2013-2017).

Diurnal concentrations for the four pollutants (ozone, NO_2, $PM_{2.5}$ and CO) at the West Phoenix monitoring site are shown below for July 6-8, 2017, in order to see the progression of the wildfire emissions as they entered the nonattainment area on the evening of July 6, 2017 and exited the nonattainment area on July 8, 2017. The diurnal pollutant concentrations are compared to the 5th, 50th and 95th percentile concentrations in order to determine non-typical pollutant behavior that is presumed to be linked to an influx of wildfire emissions. In a following subsection (Matching day analysis), the diurnal pollutant concentrations for these four pollutants are also compared specifically to non-event exceedance days in the month of July, to show the difference in pollutant behavior between a non-event exceedance day and a wildfire-caused exceedance day. For this subsection, the following paragraphs and figures describe how the diurnal concentrations of each pollutant were altered due to the influx of wildfire emissions to produce non-typical diurnal concentrations.

- **Ozone:** Figure 3-35 displays the diurnal concentrations of ozone at the West Phoenix monitor on July 6-8, 2017. As would be expected on an exceedance day, the diurnal concentrations of ozone are at or above the 95th percentile values for most of the daylight hours on July 7, 2017 (8:00am – 8:00pm). However, what is atypical for both exceedance days and non-exceedance days is the steep drop in ozone (at or below the 5th percentile) seen during the evening hours of July 6, 2017 and the morning hours of July 7, 2017. This is most likely due to an influx of transported NOx from the wildfires scavenging available ozone as the wildfire emissions entered the nonattainment area on the evening of July 6, 2017. Before arrival of the transported wildfire emissions, ozone and NO_2 diurnal concentrations during the day on July 6, 2017 were at normal (50th percentile), non-exceedance levels, suggesting that an outside source of emissions contributed the additional NO_2 around the 8:00pm hour on July 6, 2017 which then caused the scavenging of nighttime ozone on July 6, 2017 and contributed to the exceedance on July 7, 2017. Additionally, as the wildfire emissions transport out of the area on the late evening of July 7, 2017 and the early morning of July 8, 2017, there is less NO_2 available to scavenge ozone, as can be seen in the high diurnal ozone concentrations in the morning of July 8, 2017.

- **Nitrogen Dioxide (NO_2):** Figure 3-36 displays the diurnal concentrations of NO_2 at the West Phoenix monitor on July 6-8, 2017. As discussed in the subsection above on ozone diurnal concentrations, a non-typical influx of NO_2 is evident beginning in the evening of July 6, 2017 through the morning of July 7, 2017. Since NO_2 concentrations were normal during the day on July 6, 2017 prior to the elevation of NO_2 in the evening, this strongly suggests that the elevated NO_2 levels are from a source outside the nonattainment area, namely transported wildfire emissions. Recent ozone modeling performed for the *MAG 2017 Eight-Hour Ozone Moderate Area Plan for the Maricopa Nonattainment Area* (December 2016) has shown that the nonattainment area is primarily a NOx-limited area, meaning increases in NOx will lead to increases in ozone. As such, the additional influx of NO_2 as measured by the West Phoenix monitored contributed to and likely caused the ozone exceedances on July 7, 2017.

- **$PM_{2.5}$:** Figure 3-37 displays the diurnal concentrations of $PM_{2.5}$ at the West Phoenix monitor on July 6-8, 2017. For calculation of the 5th, 50th and 95th percentiles, diurnal concentrations on days with known dust storms and on July 4th and 5th (firework emissions) have been removed. Elevated levels of $PM_{2.5}$ at or above the 95th percentile are generally present from 10:00 pm on July 6, 2017 to 12:00 pm on July 7, 2017. $PM_{2.5}$ during the others hours on July 6-8, 2017 were generally below the 95th percentile except for a brief dust storm during the late evening hours of July 8,

2017. These elevated hourly concentrations also coincide with elevated NO_2 and CO concentrations recorded during the same hours. Speciated $PM_{2.5}$ data is not available for July 7, 2017, as it was not a run-day for the speciation monitor (currently operating on a 1-in-3-day schedule). The elevated $PM_{2.5}$ concentrations in tandem with the elevated concentrations of NO_2 and CO provide evidence of transported emissions from the wildfires affecting the monitors.

- **Carbon Monoxide (CO):** Figure 3-38 displays the diurnal concentrations of CO at the West Phoenix monitor on July 6-8, 2017. Similar to $PM_{2.5}$, elevated levels of CO near or at the 95th percentile are generally present from 9:00 pm on July 6, 2017 to 6:00 am on July 7, 2017. CO during the others hours on July 6-8, 2017 were almost entirely at or below the 50th percentile. These elevated hourly concentrations also coincide with elevated NO_2 and $PM_{2.5}$ concentrations recorded during the same hours. The elevated CO concentrations in tandem with the elevated concentrations of NO_2 and $PM_{2.5}$ provide evidence of transported emissions from the wildfires affecting the monitors. Additionally, in the comparison provided later in this section to prior non-event exceedance days, there were no hours with CO concentrations above the 50th percentile during the non-event exceedance (except for the elevated concentrations seen on July 28, 2014, suggesting the presence of a consistent, non-episodic elevated source of CO), providing additional evidence that a non-typical emissions source contributed to the exceedances on July 7, 2017.

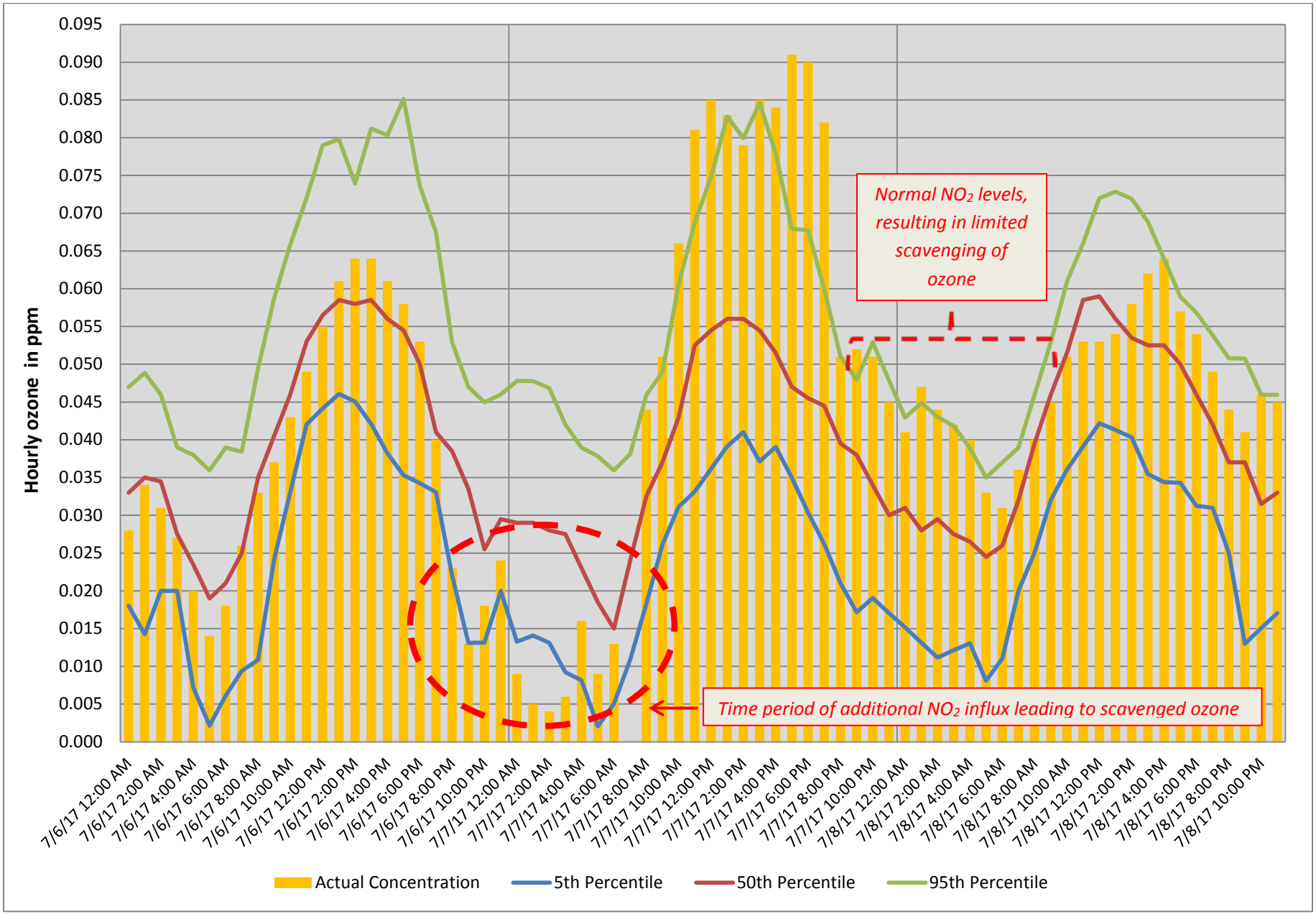

Figure 3-35. Diurnal ozone concentrations at the West Phoenix monitor on July 6-8, 2017.

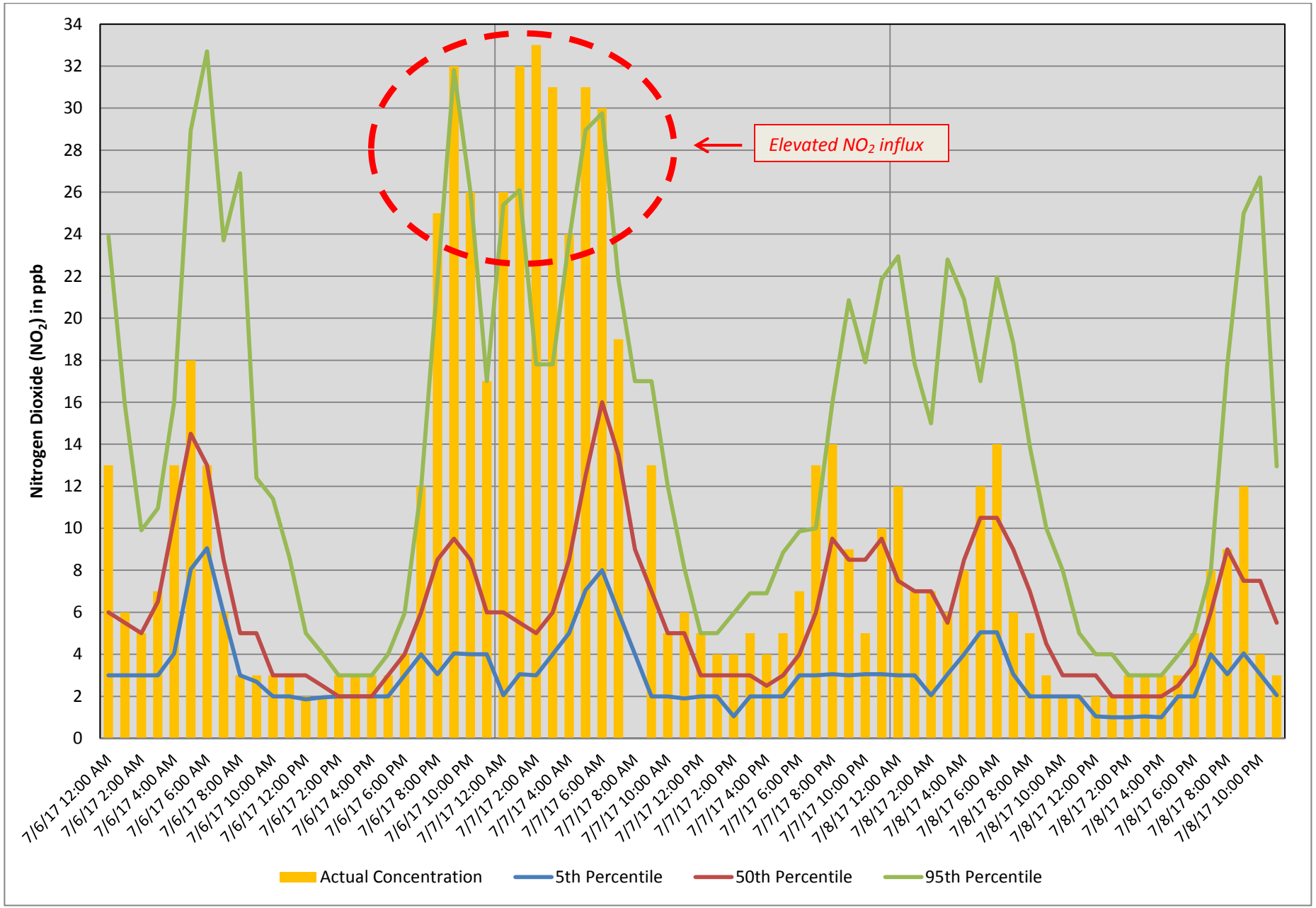

Figure 3-36. Diurnal Nitrogen Dioxide (NO_2) concentrations at the West Phoenix monitor on July 6-8, 2017.

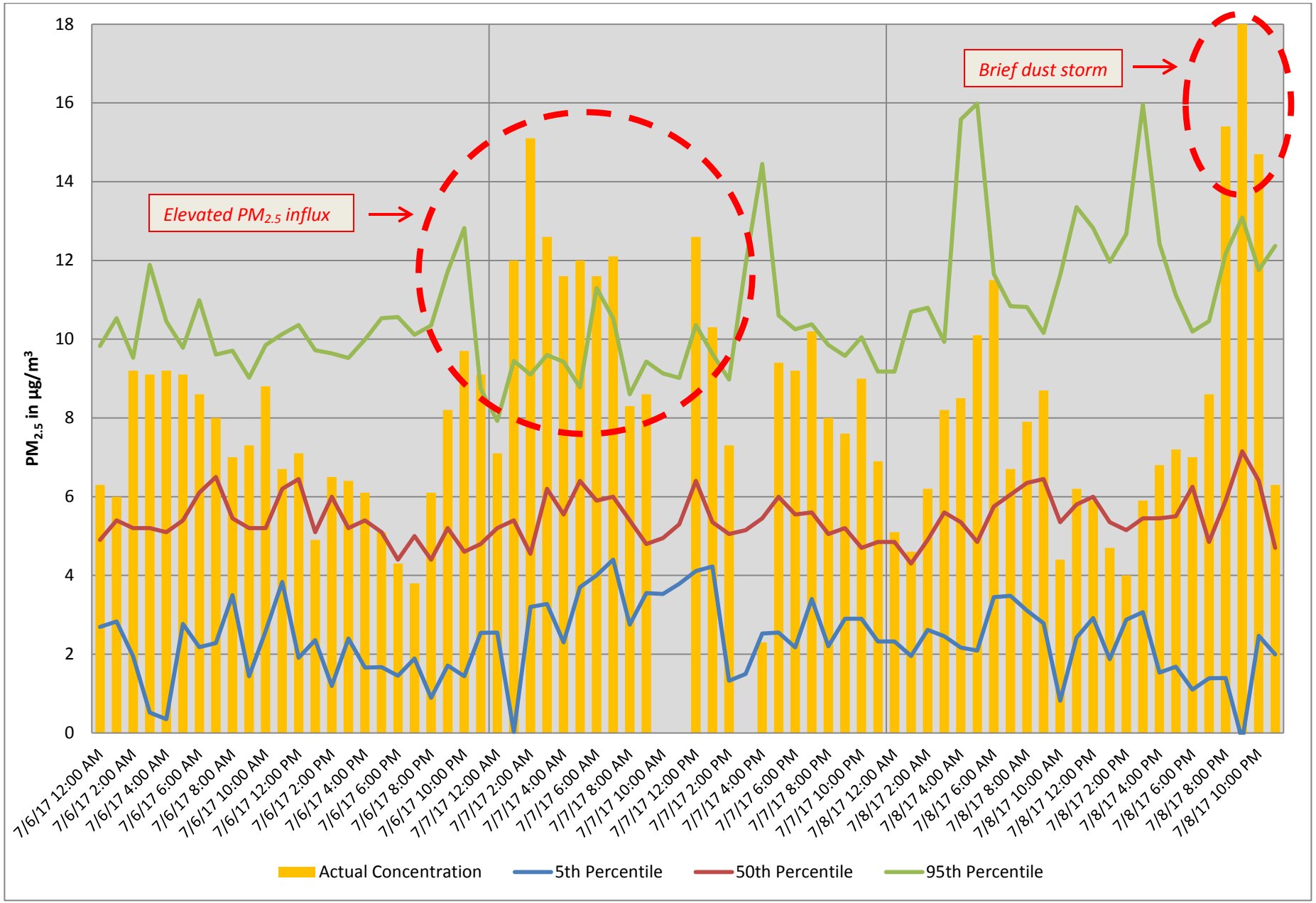

Figure 3-37. Diurnal $PM_{2.5}$ concentrations at the West Phoenix monitor on July 6-8, 2017.

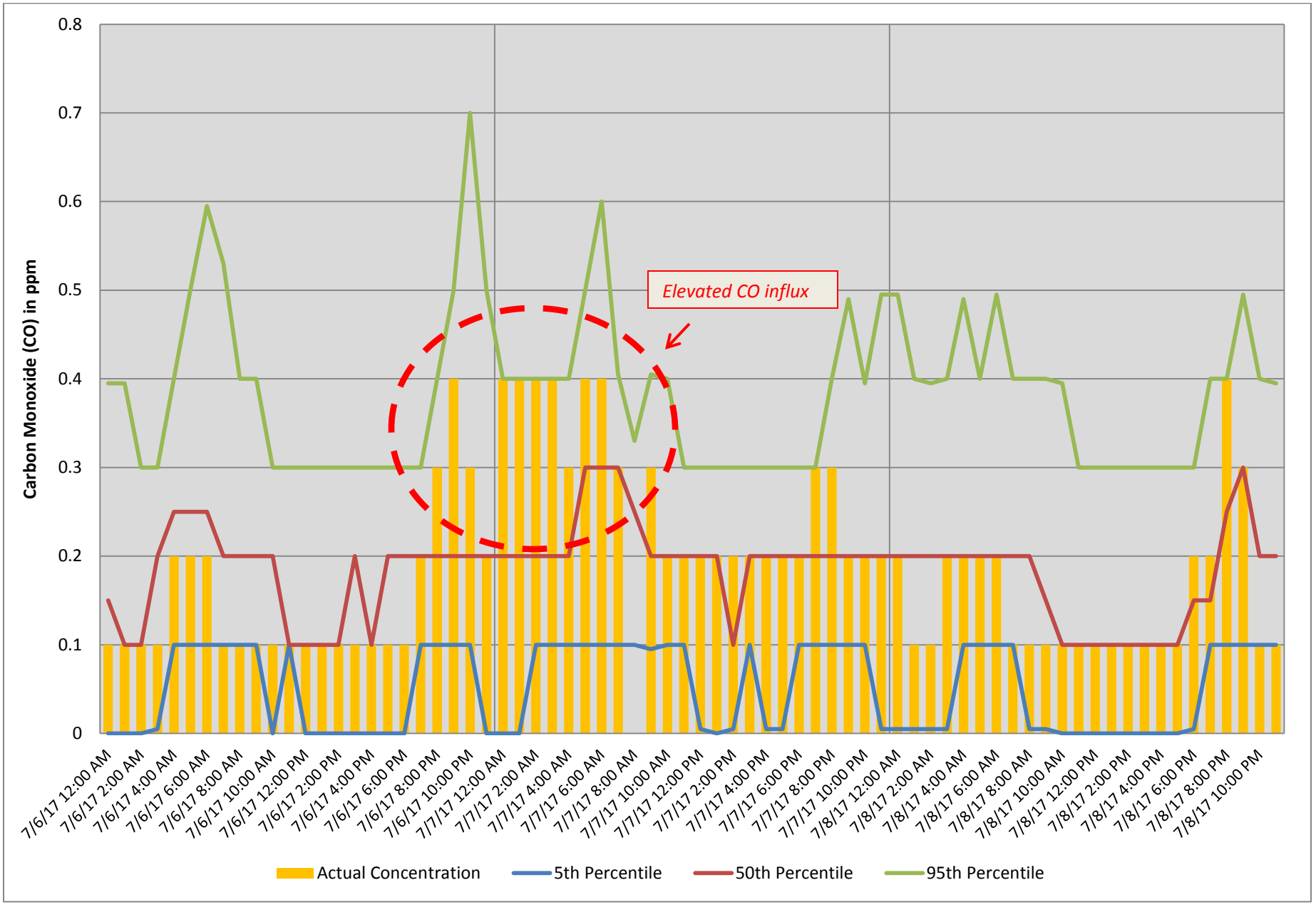

Figure 3-38. Diurnal Carbon Monoxide (CO) concentrations at the West Phoenix monitor on July 6-8, 2017.

Matching Day Analysis

In keeping with the Wildfire Guidance suggestion of including an additional source of evidence for Tier 3 demonstrations, a comparison of ozone concentrations on (1) meteorologically similar days and on (2) days with monitored non-event exceedances is included in this documentation to add weight to the previously presented evidence of the clear causal relationship between the southeastern Arizona wildfire emissions and the exceedances on July 7, 2017. This first analysis provides evidence that the meteorology present on July 7, 2017 is not sufficient on its own to produce the exceedances seen on July 7, 2017. The second analysis provides evidence that the non-event exceedances recorded in July 2013-2017 have a substantially different nature than the exceedances recorded on July 7, 2017, further establishing that the exceedances on July 7, 2017 would not have normally occurred but for the presence of the wildfire emissions.

Days with Similar Meteorological Conditions

For this analysis, meteorological data from NOAA's Local Climatological Data report for the month of July in 2013-2017 was evaluated to identify days with similar meteorological conditions as the July 7, 2017 exceedance day. NOAA's report includes daily summaries of temperature, humidity, wind speed, wind direction, precipitation, pressure, cloud cover, visibility and observable weather as recorded at the Phoenix Sky Harbor International Airport, located in the center of the Maricopa nonattainment area. Copies of the NOAA reports are included in Appendix C. Out of the 155 available days, the top five matching days with the most similar meteorological conditions were evaluated for comparison to July 7, 2017.

In order to identify the top five matching days, data from the NOAA report for July 7, 2017 was compared to the data reported for the other 154 days in July 2013-2017. July 7, 2017 was a record-setting day in terms of maximum temperatures. As such, days with high maximum temperatures were identified as candidate days. Resulting wind direction on the NOAA report was found to reasonably match 24-hour HYSPLIT back trajectories for each day. Candidate days were subsequently limited to a similar resultant wind direction observed on July 7, 2017, ranging from east-northeast to south-southeast (60° to 170°). Resultant wind speeds and average wind speeds were also evaluated to make sure they were relatively similar to July 7, 2017, although wind speeds have a larger variance than other variables. Days with significant weather events (large dust storms, heavy rain) were excluded from consideration as the weather on July 7, 2017 was generally calm, except for a thunderstorm observed in the vicinity of the airport. Additional meteorological variables such as pressure, maximum wind speeds, cloud cover and visibility were found to be less important than the prior discussed variables and did not substantially vary on average between exceedance days and non-exceedance days (humidity was found to be higher on average for exceedance days than non-exceedance days, but since July 7, 2017 was a relatively low humidity day, humidity was not considered an important variable in determining the top five matching days).

Table 3–2 provides a summary of important meteorological variables for the top 5 matching days along with the maximum daily 8-hour ozone concentration at the monitors which recorded exceedances on July 7, 2017. Of the top five matching days, four of the five days resulted in no exceedances of the 2008 ozone standard (0.075 ppm), with one day (July 8, 2013) recording exceedances at four of the nine monitors.

Table 3–3 provides a percentile ranking of the meteorological parameters and ozone concentrations in Table 3–2 for July 7, 2017 as compared to all 155 days in July 2013-2017. This table shows that with the exception of temperature, the meteorological parameters on July 7, 2017 were not exceptional (i.e., not above the 95th percentile nor below the 5th percentile), while all of the ozone concentrations were either at or above the 95th percentile. As was discussed earlier in Section II and shown in Figure 2–7, despite the uniqueness of the temperatures seen on July 7, 2017, there is no correlation between maximum temperature and maximum daily 8-hour ozone concentrations. Since all other meteorological parameters fall in the normal range for a July day, there is no convincing evidence that the meteorological conditions on July 7, 2017 were the primary cause of the extreme exceedances seen on July 7, 2017.

In summary, Tables 3–2 and 3–3 demonstrates that the meteorological conditions that existed on July 7, 2017 would not normally be enough to be the sole cause of an exceedance of the 2008 ozone standard at the monitors which recorded exceedances on July 7, 2017. The one exceedance day noted in Table 3–2 on July 8, 2013 is discussed further below; yet, as can be seen in Table 3–2, the exceedances are of less magnitude and extent than the exceedances on July 7, 2017, even though anthropogenic emissions of NOx and VOC would be expected to be significantly higher in 2013 than 2017, due to an older vehicle fleet with less stringent vehicle emissions controls. Additionally, while July 8, 2013 was never previously identified as a day that was influenced by wildfire emissions, a screening tool for identifying days impacted by wildfire emissions in a 2017 Technical Report developed by the Electric Power Research Institute (*Overview of Exceptional Event Analysis Techniques and Data Resources, October 2017*) identified July 8, 2013 as a day that was possibly influenced by wildfire emissions (access document here: https://www.epri.com/#/pages/product/000000003002010831/). $PM_{2.5}$ concentrations shown below on July 7, 2013 also point to the possibility of wildfire emissions affecting ozone concentrations on July 8, 2013. Consequently, the evidence presented in Tables 3–2 and 3–3 add weight to the assertion that the influence of transported wildfire emissions caused the exceedance on July 7, 2017, as opposed to the singular assertion that the exceedance was caused simply by the meteorological conditions that existed on July 7, 2017.

Table 3-2. Top Five Matching Meteorological Days to July 7, 2017.

Date	Max. Temp. (°F)	Min. Temp. (°F)	Avg. Temp. (°F)	Depart from Normal (°F)	Avg. Dew Point (°F)	Avg. Station Press. (in.)	Resultant Wind Speed (mph)	Resultant Wind Speed Direction	Average Wind Speed (mph)	Precip. (in.)	Maximum Daily 8-Hour Ozone Concentration (ppb)								
											CP	DY	GL	ME	NP	SU	PP	SP	WP
7/7/2017	**118**	**91**	**105**	**12**	**47**	**28.62**	**5.1**	**100°**	**7.5**	**0**	**78**	**87**	**79**	**78**	**85**	**86**	**77**	**77**	**84**
7/24/2014	116	93	105	12	53	28.60	3.9	150°	9.5	T	62	67	65	63	66	66	64	–	66
7/23/2014	114	94	104	11	54	28.66	5.1	110°	7.4	0	63	69	68	62	71	69	69	61	67
7/8/2017	113	95	104	11	52	28.65	3.1	120°	10.4	0	53	57	54	59	56	54	59	–	56
7/8/2013	113	91	102	9	54	28.61	3.0	140°	8.6	0	75	74	75	79	80	77	78	73	74
7/22/2016	112	91	102	9	55	28.67	3.0	80°	8.8	0	66	56	60	70	70	75	70	64	69

Table 3-3. Percentile Rank of Meteorological Variables and Ozone Concentrations on July 7, 2017 as Compared to All Days in July 2013-2017.

Date	Max. Temp.	Min. Temp.	Avg. Temp.	Depart from Normal	Avg. Dew Point	Avg. Station Press.	Resultant Wind Speed	Resultant Wind Speed Direction	Average Wind Speed	Precip.	Maximum Daily 8-Hour Ozone Concentration (ppb)								
											CP	DY	GL	ME	NP	SU	PP	SP	WP
7/7/2017	MAX	92nd	99th	99th	14th	20th	74th	NA	43rd	NA	99th	MAX	MAX	95th	MAX	MAX	99th	99th	MAX

CP = Central Phoenix Monitor
DY = Dysart Monitor
GL = Glendale Monitor
ME = Mesa Monitor
NP = North Phoenix Monitor
SU = Phoenix Supersite Monitor
PP = Pinnacle Peak Monitor
SP = South Phoenix Monitor
WP = West Phoenix Monitor
T = Trace

Days with Monitored Non-Event Exceedances

In July 2013-2017, there were 13 other exceedance days (besides July 7, 2017) where exceedances occurred at one or more of the nine monitors that exceeded on July 7, 2017. Table 3–4 lists the 13 exceedance days and is ordered by similarity to July 7, 2017. Table 3–4 also indicates four days that exhibited the most similar exceedance patterns to July 7, 2017.

Table 3-4. Exceedance Days of the 2008 Ozone Standard in July 2013-2017.

Date	Maximum Daily 8-Hour Ozone Concentration (ppb)								
	CP	**DY**	**GL**	**ME**	**NP**	**SU**	**PP**	**SP**	**WP**
7/7/2017	**78**	**87**	**79**	**78**	**85**	**86**	**77**	**77**	**84**
7/17/2013	79	74	76	86	80	81	74	81	83
7/18/2013	79	75	72	79	76	79	71	80	82
7/8/2013	74	75	75	79	80	77	78	73	74
7/28/2014	71	72	75	71	78	77	78	72	76
7/20/2016	69	63	71	75	76	76	71	71	73
7/21/2016	66	62	62	79	72	72	74	67	67
7/10/2017	75	64	61	78	73	75	72	73	77
7/28/2016	72	56	54	74	78	76	68	64	70
7/7/2014	67	64	68	69	78	73	69	63	71
7/14/2014	70	61	62	65	77	70	73	67	69
7/30/2016	66	58	66	71	76	69	72	66	66
7/2/2013	73	59	64	78	72	68	72	66	68
7/30/17	71	57	50	79	65	64	57	72	66

Note: Exceedances of the 2008 ozone standard appear in red text. Days with the most similar exceedance pattern to July 7, 2017 are included in the bolded box. Shaded rows indicate an ozone event that resulted in consecutive exceedance days.

CP = Central Phoenix Monitor
DY = Dysart Monitor
GL = Glendale Monitor
ME = Mesa Monitor
NP = North Phoenix Monitor
SU = Phoenix Supersite Monitor
PP = Pinnacle Peak Monitor
SP = South Phoenix Monitor
WP = West Phoenix Monitor

The four exceedance days that have exceedance patterns that are most similar to the exceedances seen on July 7, 2017 are: July 17-18, 2013, July 8, 2013 and July 24, 2014. These four days are the most similar to July 7, 2017 based upon the (1) number of monitored exceedances; (2) the magnitude of the exceedances; and (3) the magnitude of concentrations at non-exceeding monitors. These four days are assumed to be non-event exceedances, although there is some evidence that points to the exceedance on July 8, 2013 as being influenced by wildfire emissions. The other exceedance days in Table 3-4 have significantly different exceedance patterns from July 7, 2017, and have not been analyzed.

An examination of the diurnal pollutant concentrations on these four non-event exceedance days at the West Phoenix monitor reveals how these non-event exceedances exhibit significantly different diurnal concentration patterns to the wildfire-caused exceedances on July 7, 2017. These difference are the result of the influence (or lack thereof) from ozone and ozone precursor emissions from the wildfires on July 7, 2017 as compared to the non-event exceedance days. In Figures 3–39 through 3–50 below, the diurnal concentrations of ozone, NO_2, $PM_{2.5}$ and CO on the four non-event exceedance days at the West Phoenix monitor are compared to the concentrations seen on July 7, 2017. Since July 17, 2013 and July 18, 2013 are concurrent exceedance days, the two exceedance days are treated as a single event in the following figures. Consistent with data presented earlier, the diurnal data presented in Figures 3–39 through 3–50 is calculated using only monitoring data from the month of July in years 2013-2017. Additionally, in calculating the percentiles, the diurnal monitoring data is not grouped, but calculated individually for each day (i.e. the 5^{th} percentile values on July 7, 2017 (a Friday) at the West Phoenix monitor are calculated using only diurnal concentrations from West Phoenix monitoring data for Fridays in July, 2013-2017). In general, the figures show that on the four non-event days, the diurnal patterns of ozone NO_2, $PM_{2.5}$ and CO differ from the diurnal patterns seen on July 7, 2017 in the following ways:

- **Ozone:** For all four non-event exceedance days, diurnal ozone concentrations are at or near the 95^{th} percentile on the day preceding the exceedance. This is in contrast to the ozone concentrations on July 6, 2017 that were at or near the 50^{th} percentile. Since the non-event exceedances were preceded by days with higher ozone concentrations, the non-event exceedance days are largely the result of ozone accumulating within the nonattainment area until exceedance levels were reached. The wildfire event exceedance on July 7, 2017 was preceded by normal ozone levels which then dramatically jumped on July 7, 2017 due to the influx of ozone and ozone precursor emissions, particularly transported ozone and NOx.

- **NO_2:** NO_2 diurnal concentrations were much lower during the evening hours preceding the non-event exceedance days and during the morning hours of the non-event exceedance days as opposed to the levels seen on July 7, 2017. This provides evidence that NO_2 was transported in from wildfire emissions on July 7, 2017 as compared to the non-event exceedance days. The influx of transported NO_2 provided the catalyst to cause the exceedances on July 7, 2017, as opposed to the non-event day exceedances that were caused by the steady accumulation of nonattainment area ozone. NO_2 concentrations do not appear to play a role in the non-event day exceedances, as the concentrations were at normal levels.

- **$PM_{2.5}$:** Elevated $PM_{2.5}$ diurnal concentrations are only present on the July 7, 2017 wildfire exceedance day as compared to the other non-event exceedance days. The non-event exceedance on July 8, 2013, may have been preceded by wildfire-affected emissions on July 7, 2013, as $PM_{2.5}$ levels are elevated on July 7, 2013. A screening tool for identifying days impacted by wildfire emissions in a 2017 Technical Report developed by the Electric Power Research Institute (*Overview of Exceptional event Analysis Techniques and Data Resources, October 2017*) identified July 8, 2013 as a day that was possibly influenced by wildfire emissions (access

document here: https://www.epri.com/#/pages/product/000000003002010831/). The timing of the elevated $PM_{2.5}$ emissions on July 7, 2017 coincides with elevations in NO_2 and CO, as compared to the non-event days which do not show a similar pollutant coincidence.

- **CO:** Episodic elevated CO diurnal emissions were only present on the July 7, 2017 wildfire exceedance day as compared to the other non-event exceedance days. The July 28, 2014 non-event day shows constant elevated CO emissions before, during and after the exceedance, suggesting the possibility of a sustained additional source of CO being active during the non-event exceedance day. The coincident timing of the elevated CO, NO_2 and $PM_{2.5}$ concentrations on the July 7, 2017 wildfire event day tie the elevated CO emissions to transported ozone and ozone precursor emissions from wildfire activity.

In summary, the wildfire-event exceedance on July 7, 2017 exhibited very different diurnal concentration patterns of ozone, NO_2, $PM_{2.5}$ and CO as compared to non-event exceedance days with the most similar distribution and magnitude of exceedances in July 2013-2017. The evaluated non-event exceedance days all exhibited diurnal concentration patterns linked to the constant accumulation of ozone within the nonattainment area, leading to the eventual exceedances seen on the non-event days. This is in contrast to the July 7, 2017 wildfire event day, which does not have an accumulation of ozone prior to the event, and has coinciding transient spikes of NO_2, $PM_{2.5}$ and CO that are indicative of the transport of an outside source of emissions into the nonattainment area. The uniqueness of the exceedances seen on July 7, 2017 as compared to non-event exceedances in July 2013-2017 further serves to strengthen the clear causal relationship between transported ozone and ozone precursor emissions from the southeastern Arizona wildfires and the exceedances on July 7, 2017 established earlier in this section.

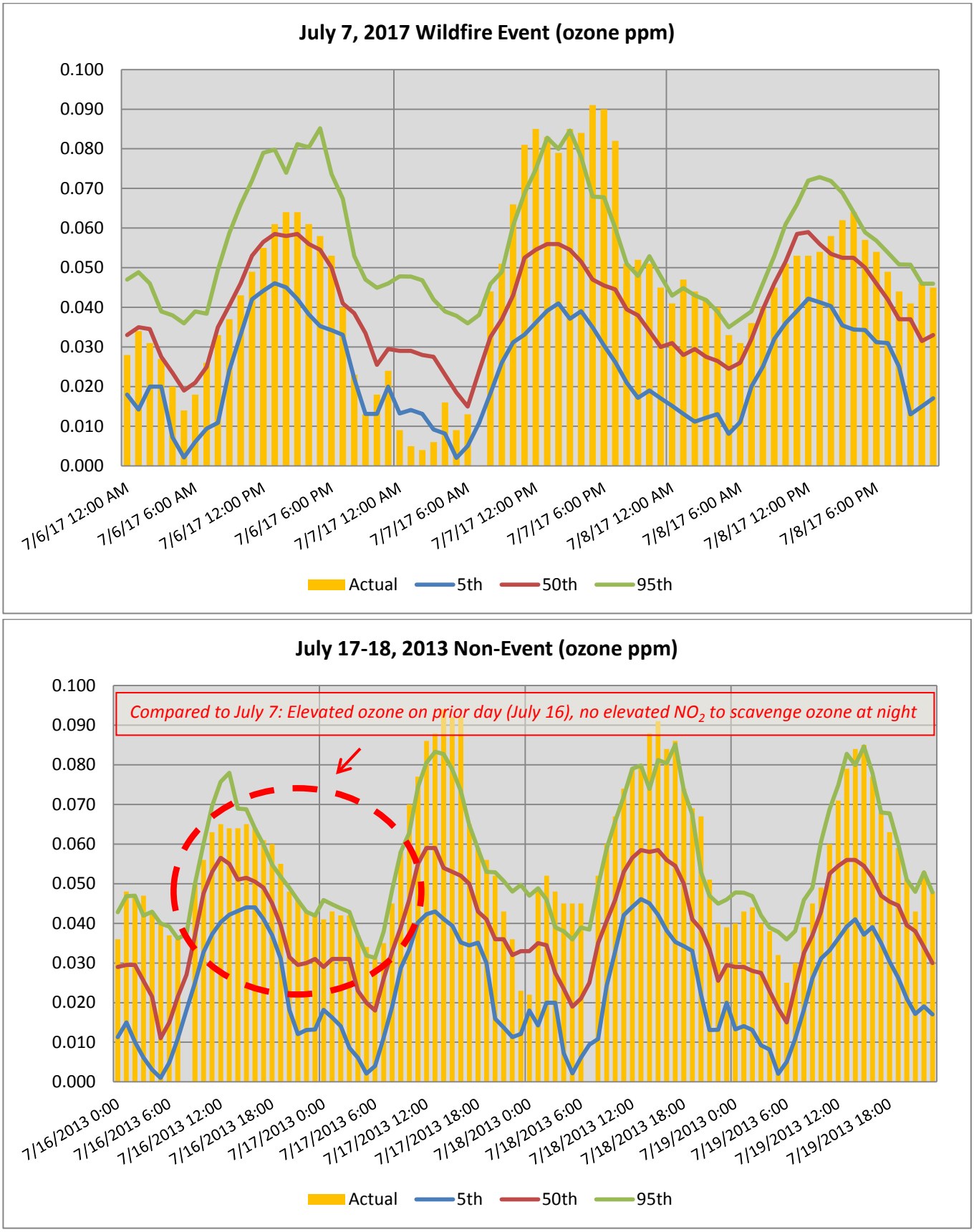

Figure 3-39. Comparison of diurnal ozone concentrations on July 7, 2017 and July 17-18, 2013 at the West Phoenix monitor.

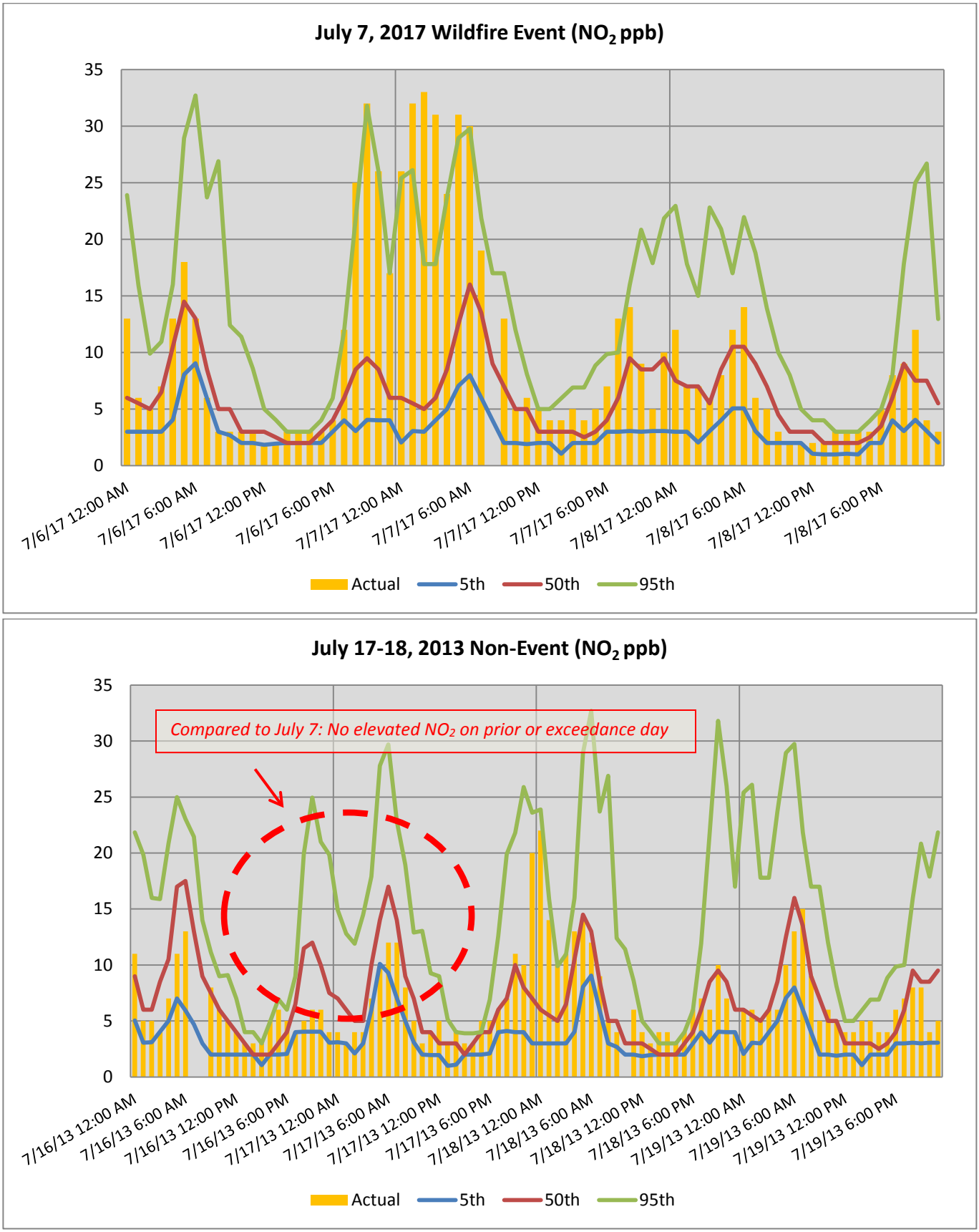

Figure 3-40. Comparison of diurnal NO_2 concentrations on July 7, 2017 and July 17-18, 2013 at the West Phoenix monitor.

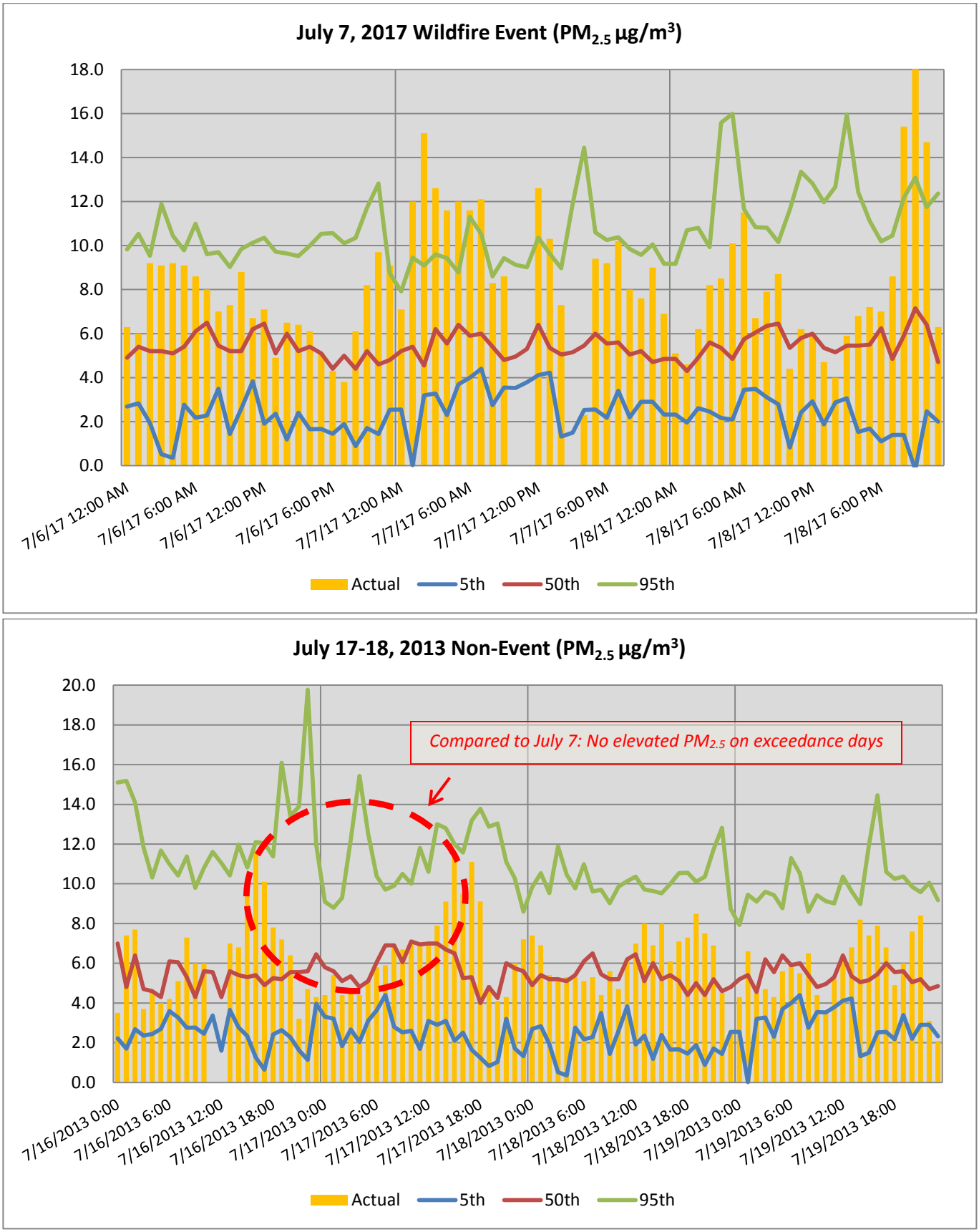

Figure 3-41. Comparison of diurnal $PM_{2.5}$ concentrations on July 7, 2017 and July 17-18, 2013 at the West Phoenix monitor.

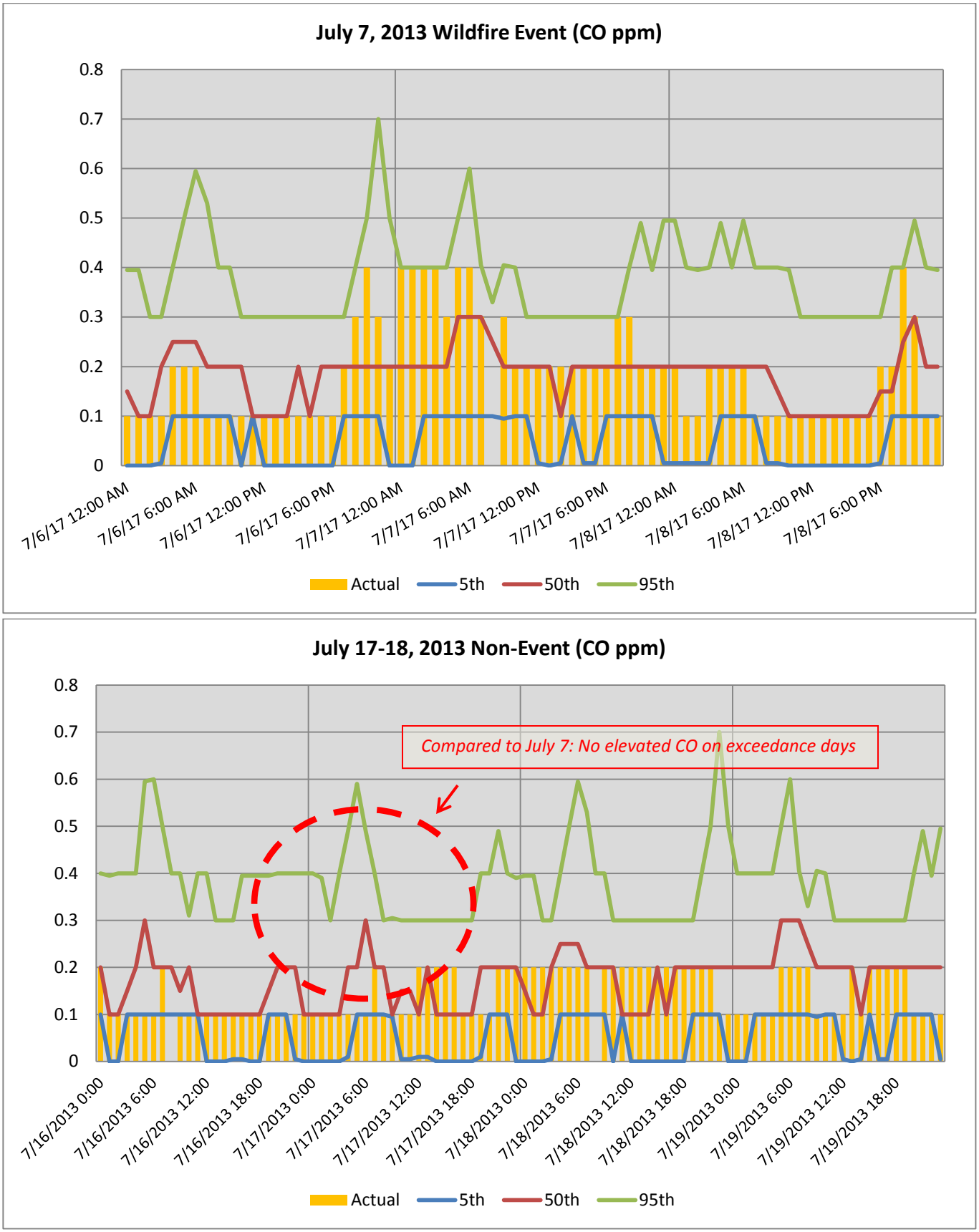

Figure 3-42. Comparison of diurnal CO concentrations on July 7, 2017 and July 17-18, 2013 at the West Phoenix monitor.

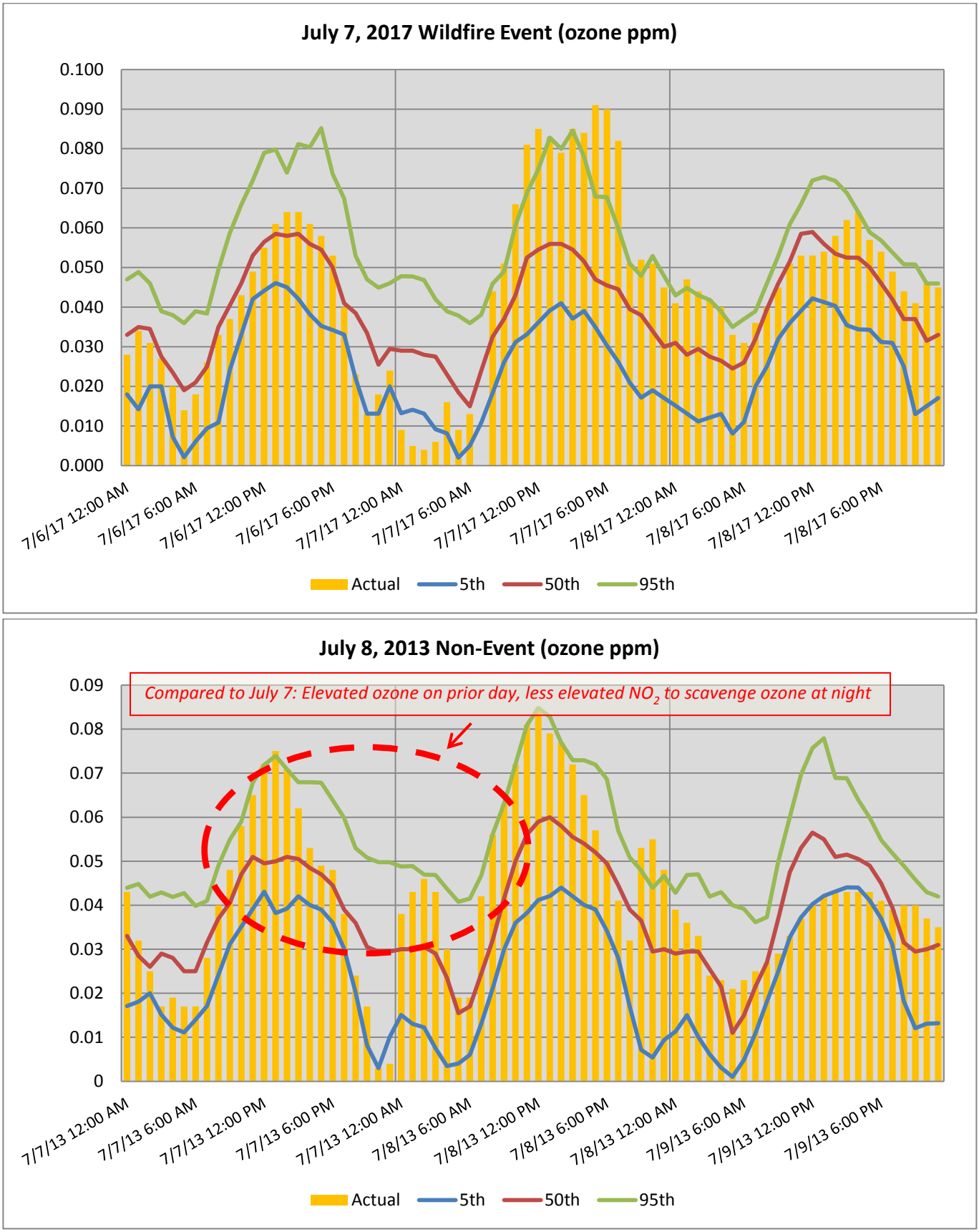

Figure 3-43. Comparison of diurnal ozone concentrations on July 7, 2017 and July 8, 2013 at the West Phoenix monitor.

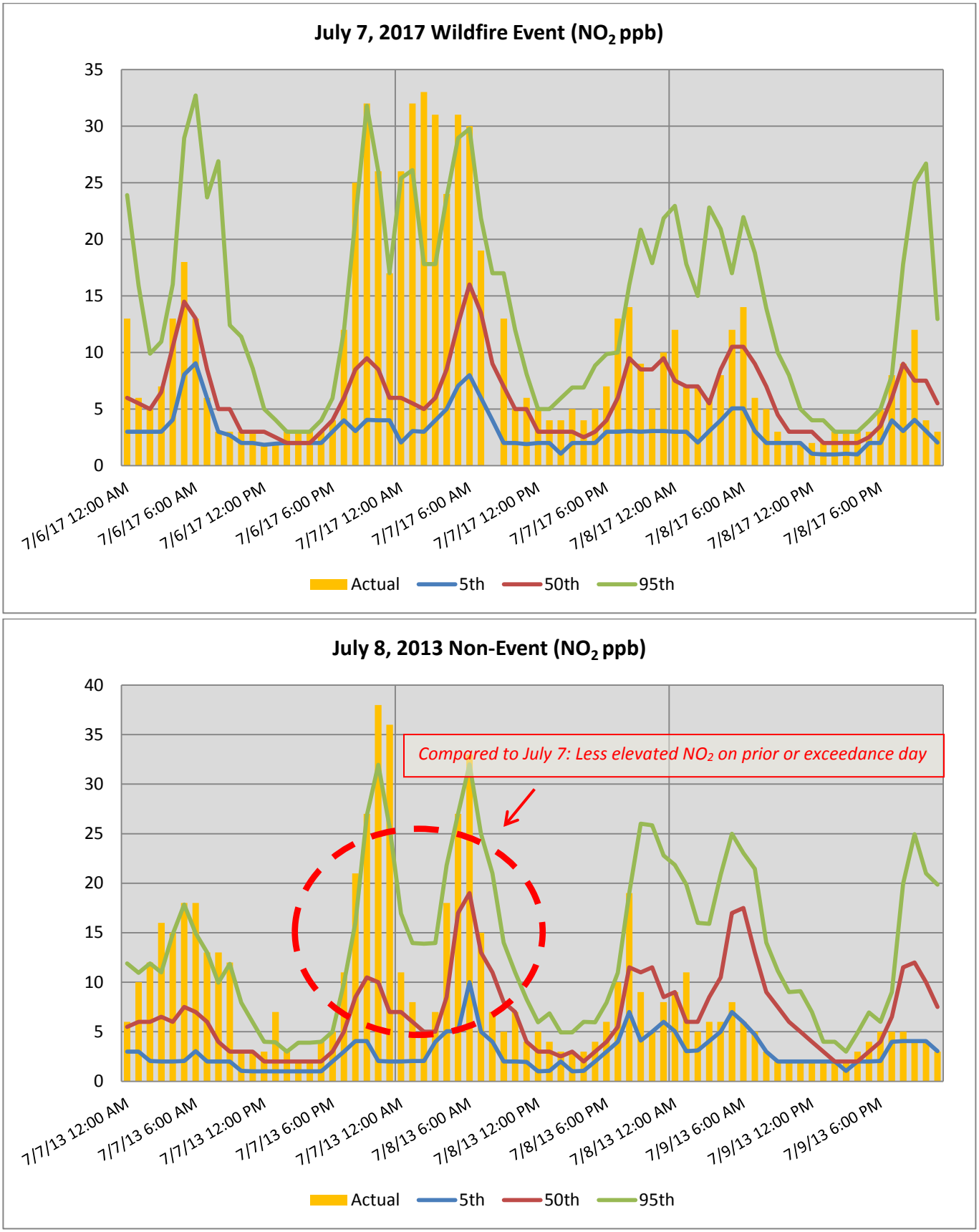

Figure 3-44. Comparison of diurnal NO_2 concentrations on July 7, 2017 and July 8, 2013 at the West Phoenix monitor.

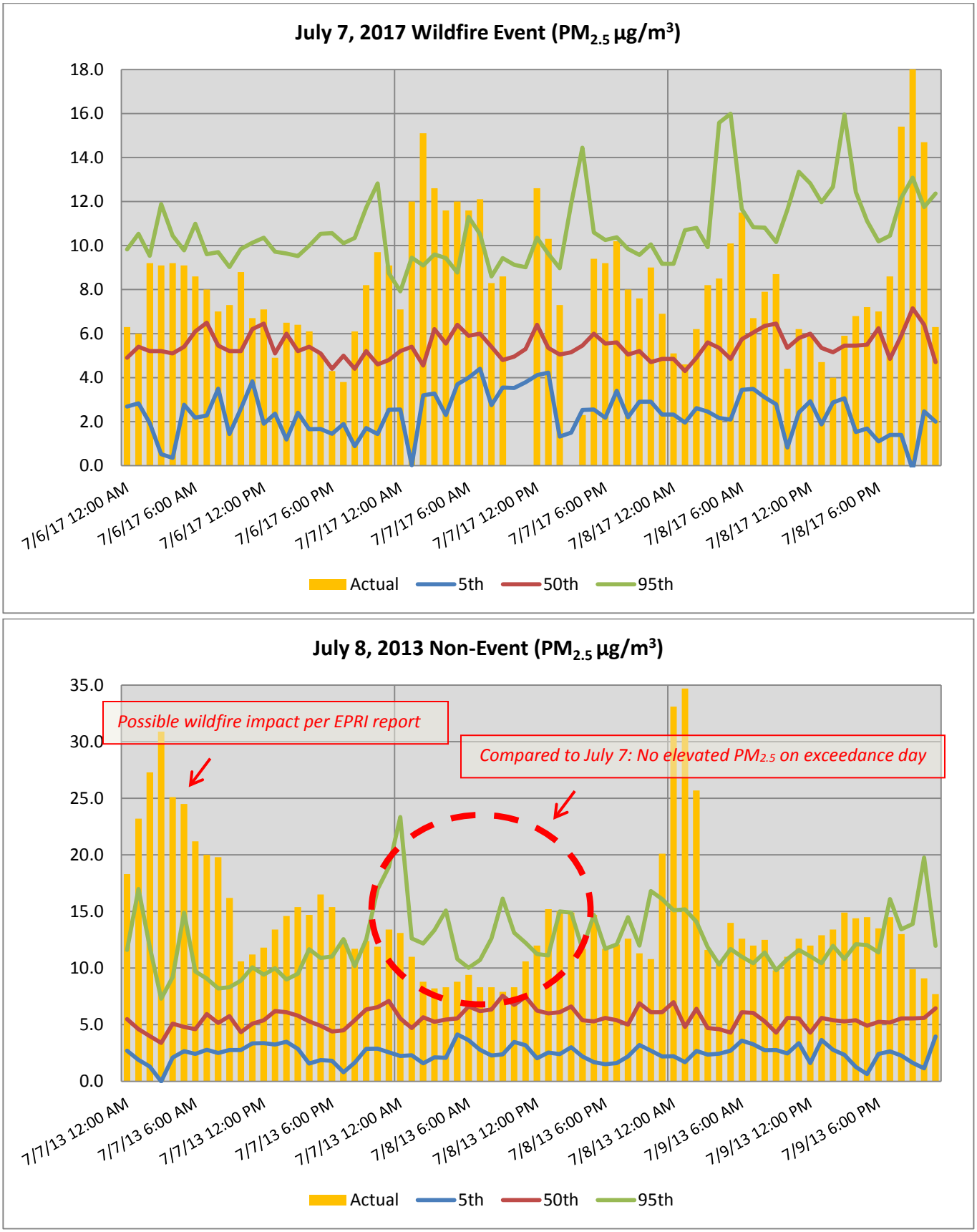

Figure 3-45. Comparison of diurnal $PM_{2.5}$ concentrations on July 7, 2017 and July 8, 2013 at the West Phoenix monitor.

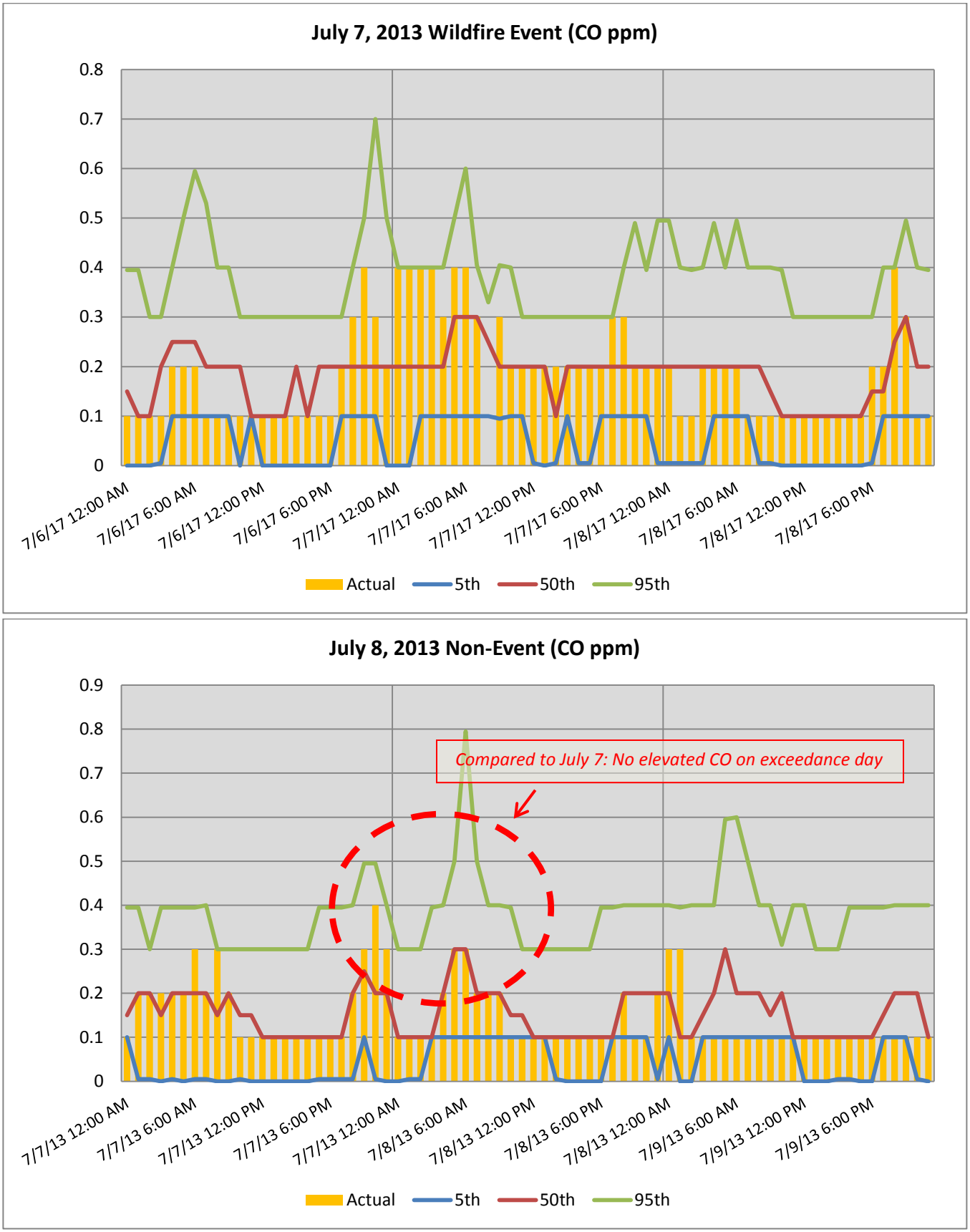

Figure 3-46. Comparison of diurnal CO concentrations on July 7, 2017 and July 8, 2013 at the West Phoenix monitor.

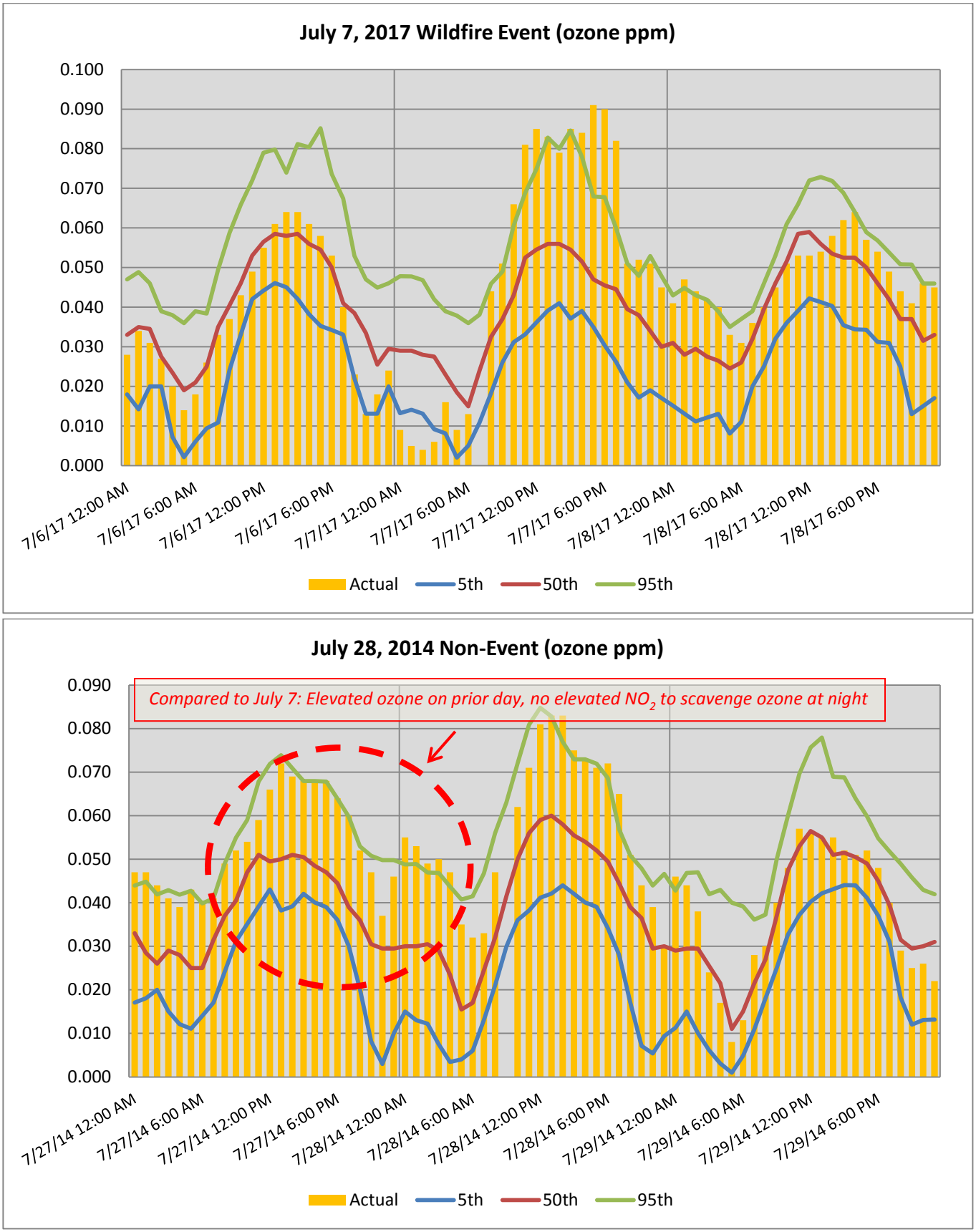

Figure 3-47. Comparison of diurnal ozone concentrations on July 7, 2017 and July 28, 2014 at the West Phoenix monitor.

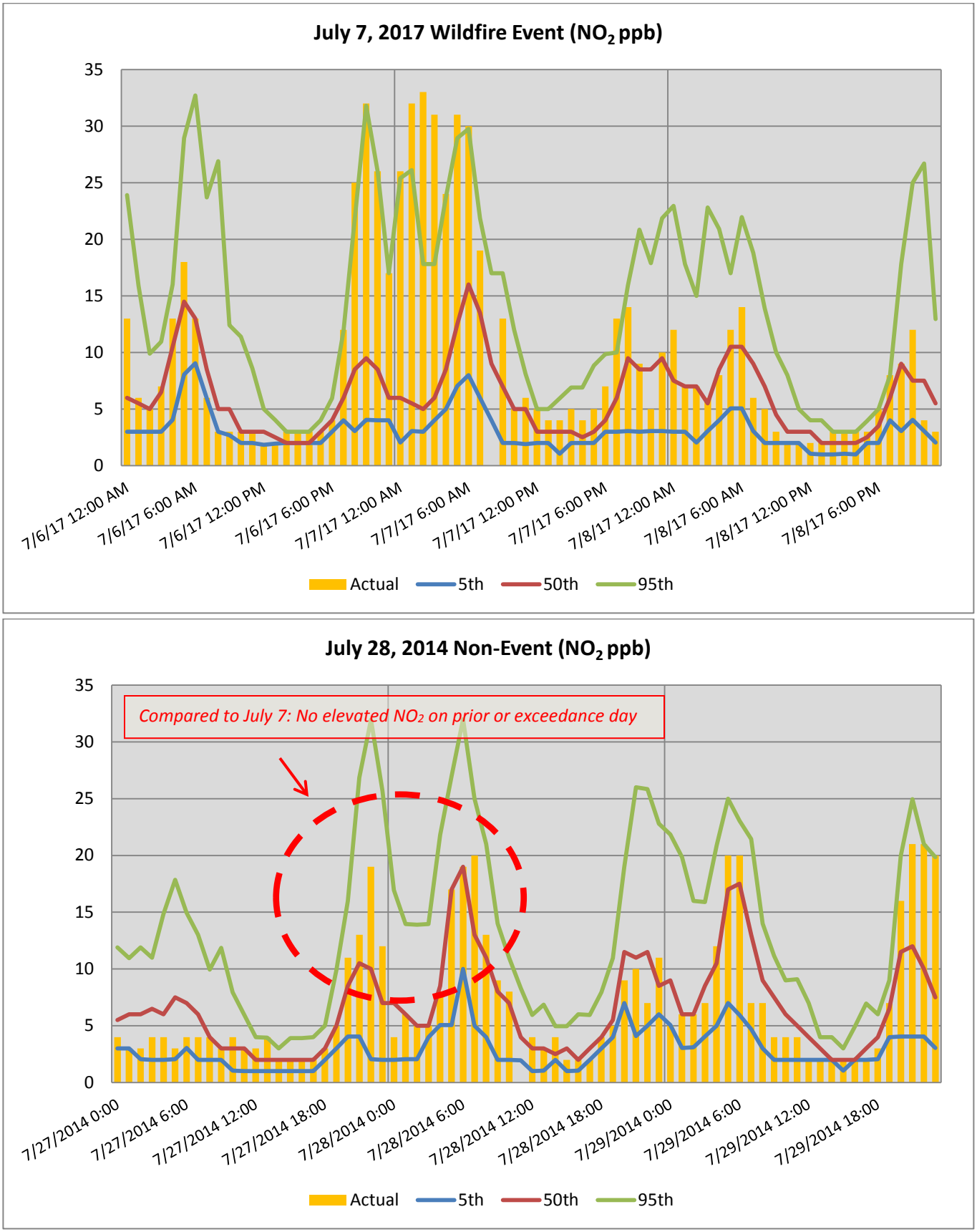

Figure 3-48. Comparison of diurnal NO_2 concentrations on July 7, 2017 and July 28, 2014 at the West Phoenix monitor.

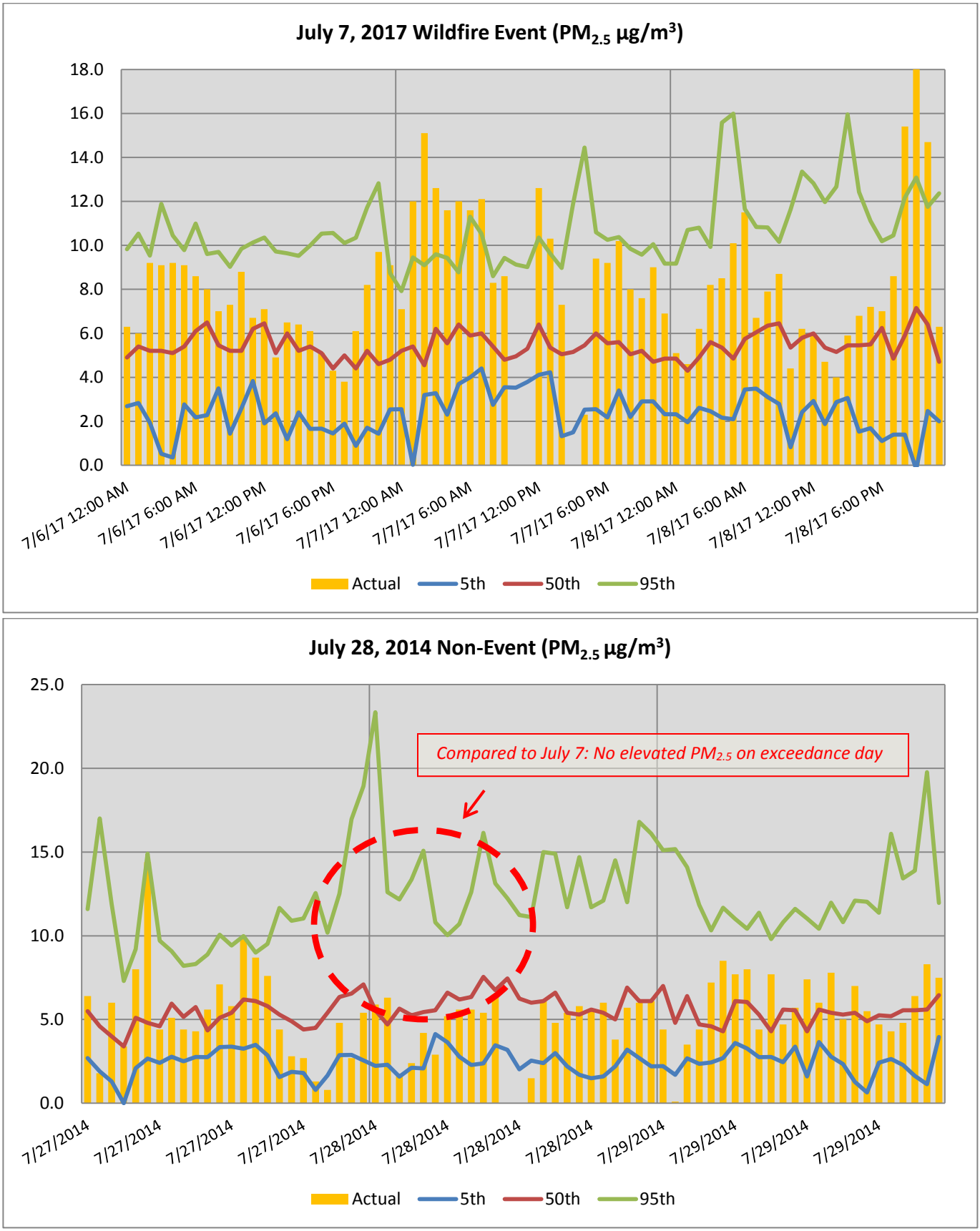

Figure 3-49. Comparison of diurnal $PM_{2.5}$ concentrations on July 7, 2017 and July 28, 2014 at the West Phoenix monitor.

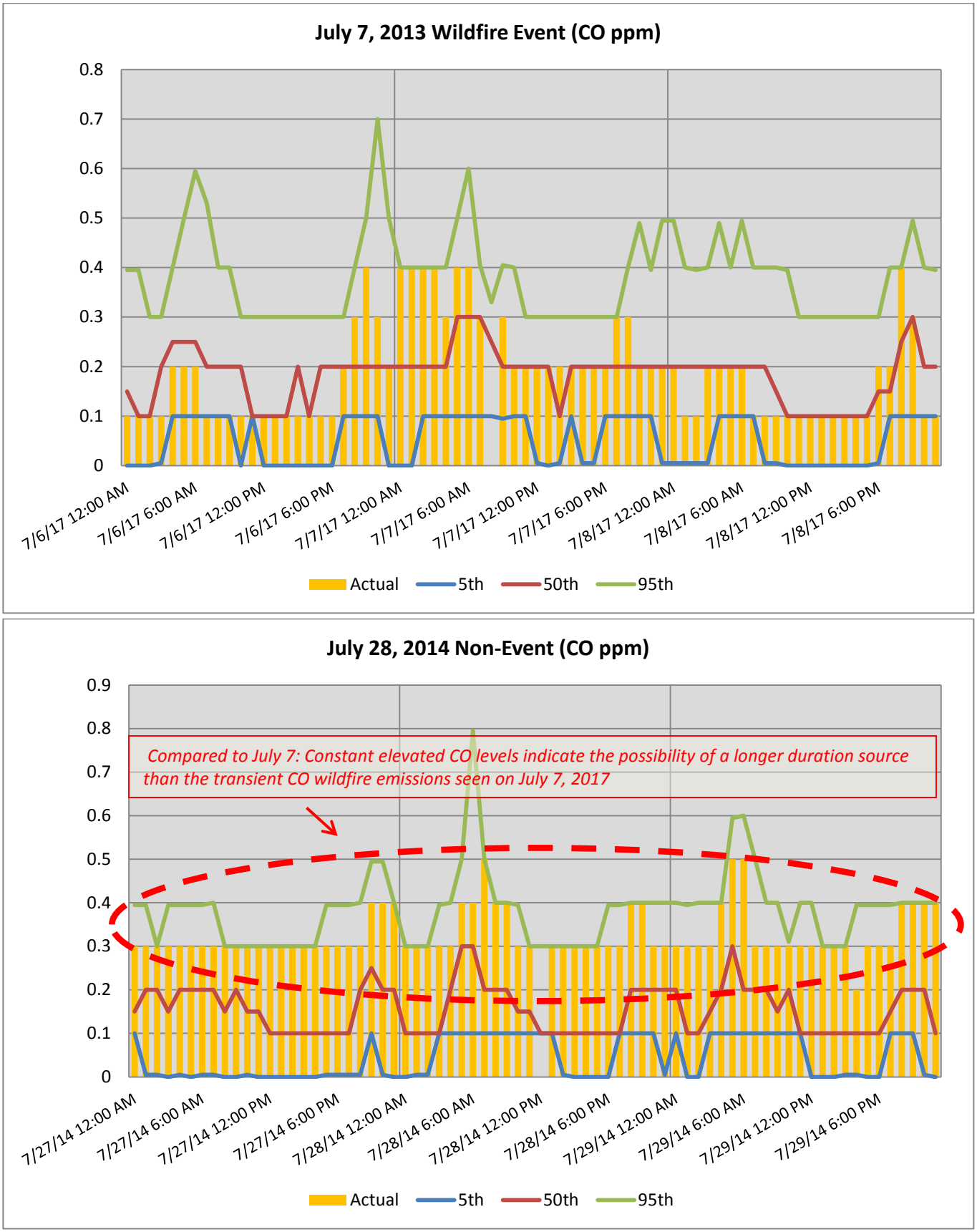

Figure 3-50. Comparison of diurnal CO concentrations on July 7, 2017 and July 28, 2014 at the West Phoenix monitor.

IV. NATURAL EVENT AND NOT REASONABLY CONTROLLABLE OR PREVENTABLE CRITERIA

Natural Event

Clean Air Act Section 319(b)(1)(A)(iii) defines an exceptional event as "an event caused by human activity that is unlikely to recur at a particular location or a natural event". The current Exceptional Events Rule at 40 CFR Section 50.14(c)(3)(iv)(A) requires that evidence be provided in an exceptional event demonstration that this definition has been met. EPA's Exceptional Events Rule defines a wildfire as "any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has been declared to be a wildfire. A wildfire that predominantly occurs on wildland is a natural event." The rule further defines wildland as "an area in which human activity and development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered." Lastly, in the Wildfire Guidance, EPA states that "the EPA believes that treating all wildfires on wildland as natural events is consistent with the CAA and the EER."

Based on the documentation provided in Section II of this submittal, the event meets the definition of a wildfire, as the southeastern Arizona wildfires were all located on wildlands. As EPA considers all wildfires to be natural events, the wildfire event that caused the ozone exceedances in the Maricopa nonattainment area on July 7, 2017 therefore qualifies as a natural event.

Not Reasonably Controllable or Preventable

Clean Air Act Section 319(b)(1)(A)(ii) requires that an exceptional event be "not reasonably controllable or preventable". The Exceptional Events Rule at 40 CFR Section 50.14(c)(3)(iv)(D) also requires that evidence be provided in an exceptional event demonstration that the event was not reasonably controllable or preventable. This criterion applies to both natural events and events caused by human activity unlikely to recur.

The Exceptional Events Rule clarifies that the documentation of the event must demonstrate that the event was both not reasonably controllable and not reasonably preventable. Both the Wildfire Guidance and the Exceptional Events Rule (see 40 CFR Section 50.14(b)(4)) presume that wildfires on wildlands satisfy both of these factors. Since the wildfires have been shown to be wildfires on wildlands in prior sections of this submittal, the exceedances on July 7, 2017 are therefore neither reasonably controllable nor preventable. Based upon the documentation shown in Section II of this submittal, either lightning, unauthorized or accidental human activity, or unknown sources caused the wildfire events on the wildlands. ADEQ is not aware of any evidence clearly demonstrating that prevention or control efforts beyond those actually made would have been reasonable. Therefore, emissions from these wildfires were not reasonably controllable or preventable.

V. SUMMARY CONCLUSION

The documentation presented above provides ample weight of evidence that the nine exceedances of the 2008 ozone standard on July 7, 2017 in the Maricopa eight-hour ozone nonattainment area were caused by transported ozone and ozone precursor emissions from the southeastern Arizona wildfires qualifying these exceedances for exclusion under the Exceptional Events Rule. A bulleted summary of the documentation is provided below:

- The event affected air quality at the exceeding monitors as evidenced by a historical comparison of the ozone concentrations at the exceeding monitors. This comparison indicated that the exceedances on July 7, 2017 were either at or above the 99th percentile, or the exceedance was one of the top four highest concentrations recorded in 2017. Evidence presented in support of a clear causal relationship between the July 7, 2017 exceedances and the transported ozone and ozone precursor emissions from the wildfires forms a link between the affected air quality at the exceeding monitors and the wildfire emissions.

- The conceptual model discussion of how the wildfire emissions affected ozone concentrations in the Maricopa nonattainment area and the discussion of the clear causal relationship between the nine exceedances in the Maricopa nonattainment area and the transported ozone and ozone precursor emissions from the wildfires is established through the following weight of evidence:

  (1) Maps and documentation showing the location and extent of the wildfires during July 1-10, 2017;
  (2) NOAA smoke maps showing the dispersion of smoke across Arizona on July 1-10, 2017;
  (3) Calculation of the daily VOC and NOx emissions from the wildfires and the Q/D ratio for July 5-7, 2017;
  (4) HYSPLIT back trajectories confirming air movement from the wildfire and smoke area to the nonattainment area at lower, middle and upper altitudes;
  (5) Satellite photos of transported smoke across Arizona preceding the exceedances;
  (6) Regional ozone concentration rises throughout southeastern Arizona and the nonattainment area in response to the transported emissions from the wildfires;
  (7) Smoke impacts as seen through visibility photos within the nonattainment area;
  (8) A discussion of the non-typical diurnal concentration of ozone, NO_2, $PM_{2.5}$ and CO at the exceeding monitors;
  (9) An analysis that the meteorological conditions that existed on July 7, 2017 were not necessarily sufficient on their own to produce the exceedances on July 7, 2017; and
  (10) An analysis showing the exceedances on July 7, 2017 differed substantially in nature and in cause when compared to other non-event exceedances in July 2013-2017.

- The event is a natural event. Wildfires on wildlands (whether caused by human activity or natural activity) are acknowledged as natural events in the Wildfire Guidance and the final Exceptional Events Rule. The southeastern Arizona wildfires occurred on wildlands as shown in Section II.

- The wildfire event was neither reasonably controllable nor preventable, as ADEQ is not aware of any evidence clearly demonstrating that prevention or control efforts beyond those actually made would have been reasonable. Therefore, emissions from these wildfires were not reasonably controllable or preventable.

APPENDIX A

ADEQ FORECAST PRODUCTS FOR GREATER PHOENIX AREA

Phoenix Forecast

ADEQ Arizona Department of Environmental Quality

Air Quality

ISSUED ON: Thu. Jul 6, 2017

This report is updated Monday through Friday and is valid for areas within and bordering Phoenix, Arizona

Today | Thursday 7/6/2017 **105** **Ozone**	HPA	**Health Statement:** Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
Tomorrow | Friday 7/7/2017 **129** **Ozone**	HPA	**Health Statement:** Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing
Extended | Saturday 7/8/2017 **93** **Ozone**	HW **Possible**	**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Possible
Extended | Sunday 7/9/2017 **90** **Ozone**	HW **Possible**	**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Likely
Extended | Monday 7/10/2017 **84** **Ozone**		**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Possible

"High Pollution Advisory" (HPA): Is when the highest concentration of OZONE, PM10, or PM2.5 may exceed the federal health standard.
"**Health Watch" (HW)**: Is when the highest concentration of OZONE, PM10 or PM2.5 may approach the federal health standard.

Air Pollutant Breakdown

O3 = Ozone, CO = Carbon Monoxide, PM10 = Particles 10 microns & smaller, PM2.5 = Particles smaller than 2.5 microns

Pollutant	Yesterday Highest Site	Thursday 7/6/2017	Friday 7/7/2017	Saturday 7/8/2017	Sunday 7/9/2017	Monday 7/10/2017
O_3	71 Tonto National	105	129	93	90	84
CO	7 Diablo	7	9	6	6	7
PM_{10}	59 West 43rd	58	61	51	73	52
$PM_{2.5}$	55 Mesa	46	42	35	42	46

Forecast Continued:

Synopsis & Discussion

Forecaster: –J. Malloy

Ozone will take center stage for the final days of the workweek and perhaps the weekend, as well. An Ozone High Pollution Advisory remains in effect for today and will be extended through at least Friday to account for a less than ideal dispersion pattern. Any thunderstorm outflows entering the Valley over the next few days likely reach our monitors near or after when hourly ozone concentrations usually peak.

Overall, the weather pattern does become complicated in the short-term as a battle between dry and moist air masses endures throughout Arizona. So far, dry air has won out. Today, things start to change. Deeper moisture increases and so does thunderstorm coverage in the higher terrain. This upward trend in storm coverage is more evident on Friday. Gusty outflow winds (mainly from the north and east) to pick up loose soils is possible each day going forward. There remains no clear-cut day for large dust storm potential from the south…yet. Stay tuned.

Check back on Friday for a closer look at the weekend's weather and air quality. Until then, have a good day!

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Phoenix Forecast

ADEQ Arizona Department of Environmental Quality

Air Quality

ISSUED ON: Fri. Jul 7, 2017

This report is updated Monday through Friday and is valid for areas within and bordering Phoenix, Arizona

Today | Friday 7/7/2017 **129** **Ozone**	HPA	**Health Statement:** Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Possible
Tomorrow | Saturday 7/8/2017 **93** **Ozone**	HW	**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Possible
Extended | Sunday 7/9/2017 **93** **Ozone**	HW	**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Likely
Extended | Monday 7/10/2017 **84** **Ozone**		**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Possible
Extended | Tuesday 7/11/2017 **80** **Ozone**		**Health Statement:** Unusually sensitive people should consider reducing prolonged outdoor exertion. **Notice:** Late-day Outflow Winds with Localized Blowing Dust Possible

"High Pollution Advisory" (HPA): Is when the highest concentration of OZONE, PM10, or PM2.5 may exceed the federal health standard.
"**Health Watch" (HW)**: Is when the highest concentration of OZONE, PM10 or PM2.5 may approach the federal health standard.

Air Pollutant Breakdown

O3 = Ozone, CO = Carbon Monoxide, PM10 = Particles 10 microns & smaller, PM2.5 = Particles smaller than 2.5 microns

Pollutant	Yesterday Highest Site	Friday 7/7/2017	Saturday 7/8/2017	Sunday 7/9/2017	Monday 7/10/2017	Tuesday 7/11/2017
O_3	105 Mesa	129	93	93	84	80
CO	7 Diablo	9	6	6	7	7
PM_{10}	58 Higley	86	53	81	52	51
$PM_{2.5}$	48 Mesa	42	35	44	42	40

Forecast Continued:

Synopsis & Discussion

Forecaster: –R. Nicoll

Particulates are elevated this morning, especially near the Durango curve. As a result, we have increased today's PM-10 AQI value to account for this. As for dust the rest of the period, thunderstorm outflow potential will exist most afternoons/evenings which could cause blowing dust. We expect the best chance for dust from thunderstorm outflows to be Sunday afternoon. In the event of a dust storm, remember to "Pull Aside, Stay Alive". Ozone has also been a concern, fortunately, we do expect to see some improvement over the coming days. We still have the ozone High Pollution Advisory in effect for today, but have concentrations falling to Health Watch criteria over the weekend. By next week we expect ozone to remain in the upper-Moderate range but below Health Watch criteria.

Check back on Monday for a look ahead at next week's weather and air quality. Until then, have a great weekend!

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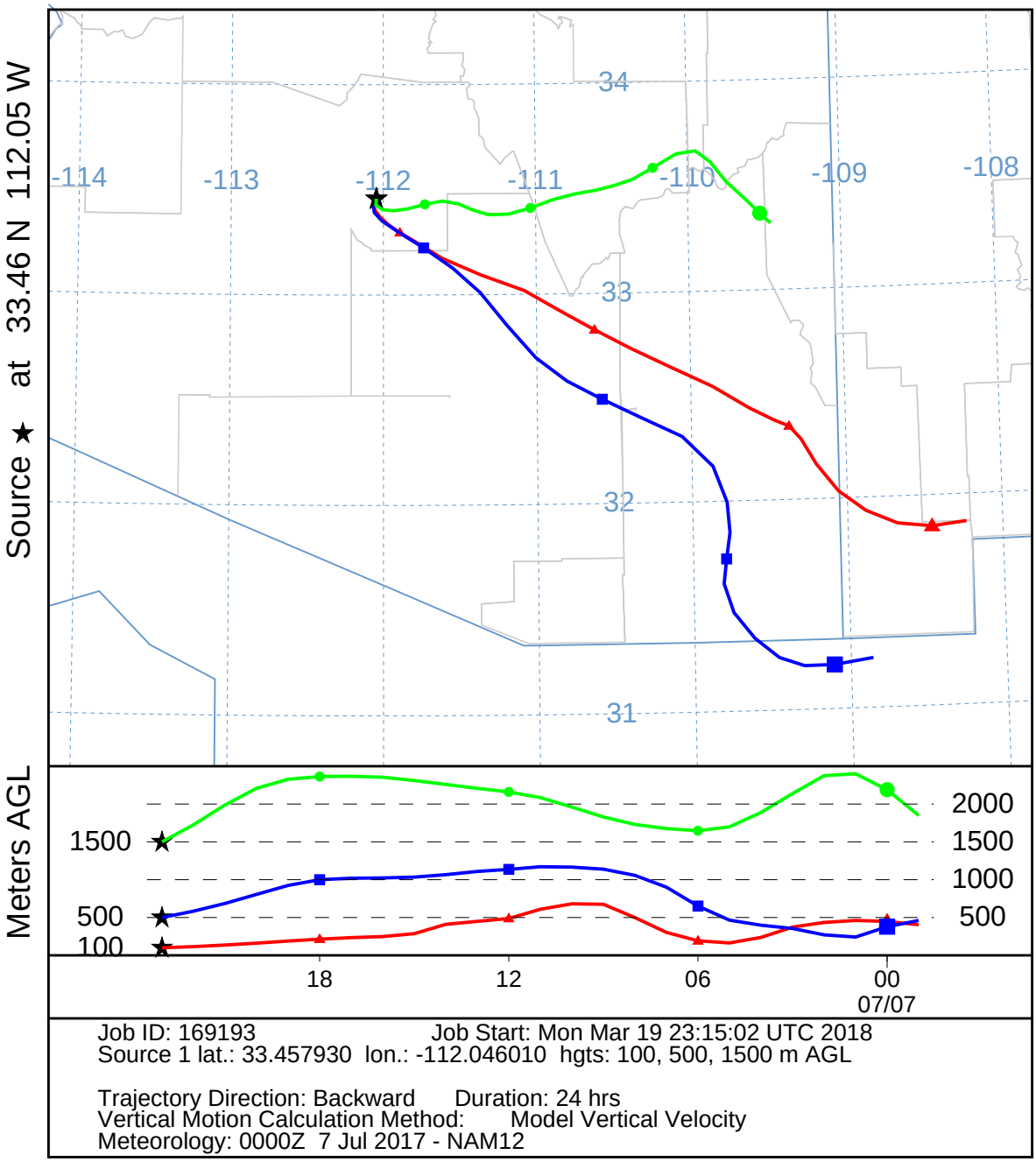
APPENDIX B

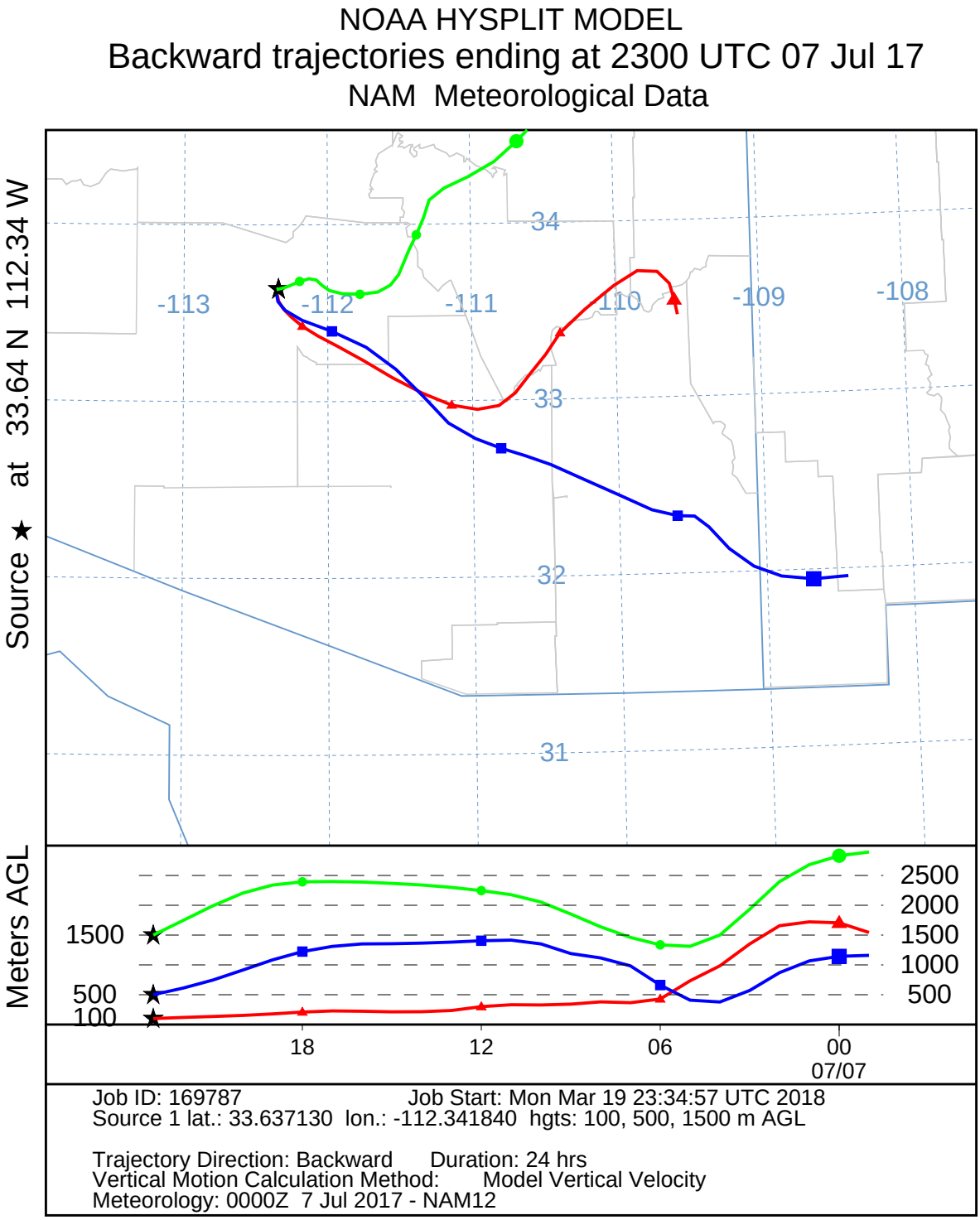
NOAA HYSPLIT MODEL OUTPUT FILES

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data

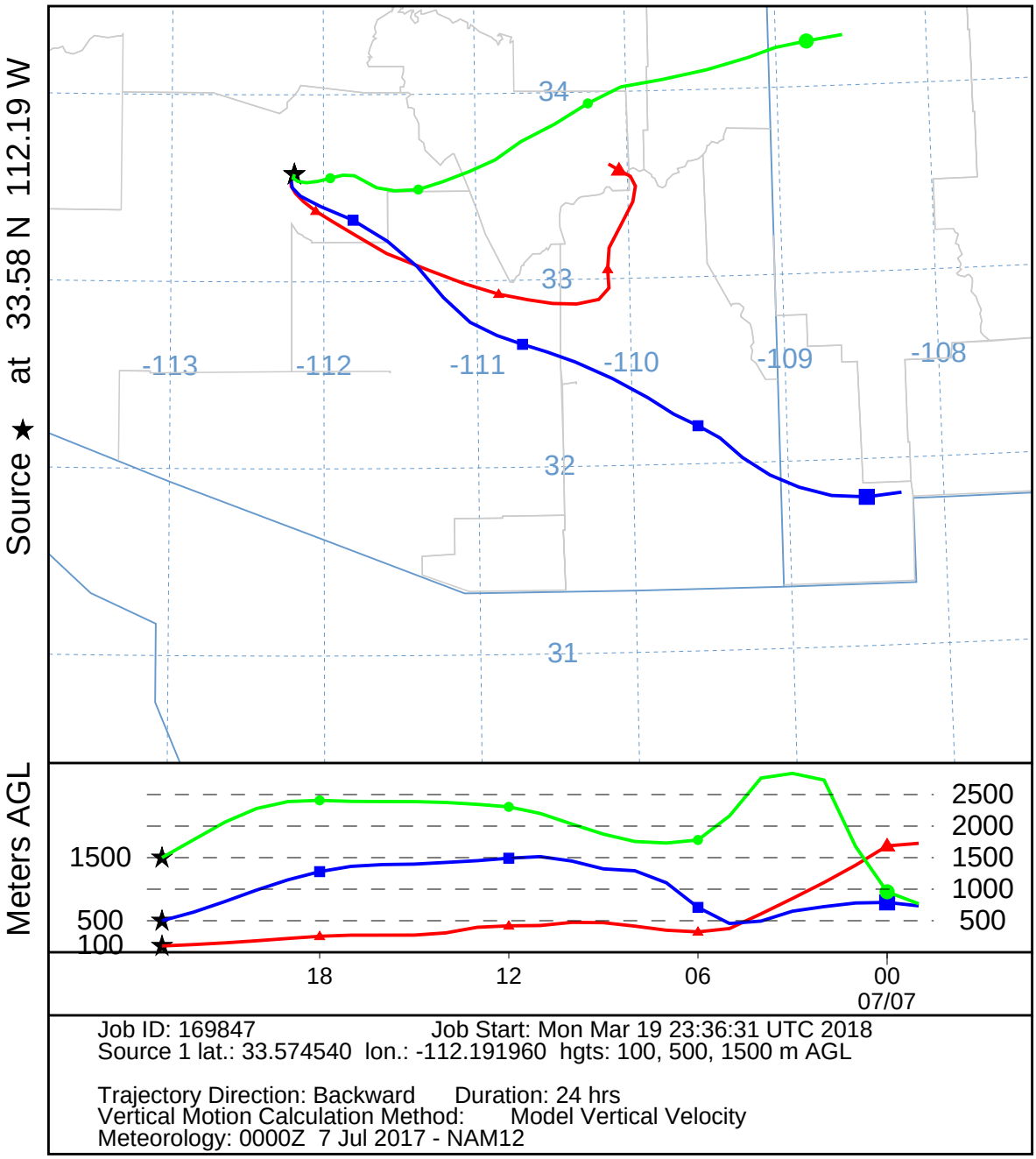


Job ID: 169193 Job Start: Mon Mar 19 23:15:02 UTC 2018
Source 1 lat.: 33.457930 lon.: -112.046010 hgts: 100, 500, 1500 m AGL

Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12


NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data
Source ★ at 33.64 N 112.34 W
34
33
32
31
-113
-112
-111
-110
-109
-108
Meters AGL
2500
2000
1500
1000
500
1500
500
100
18
12
06
00
07/07
Job ID: 169787 Job Start: Mon Mar 19 23:34:57 UTC 2018
Source 1 lat.: 33.637130 lon.: -112.341840 hgts: 100, 500, 1500 m AGL
Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data

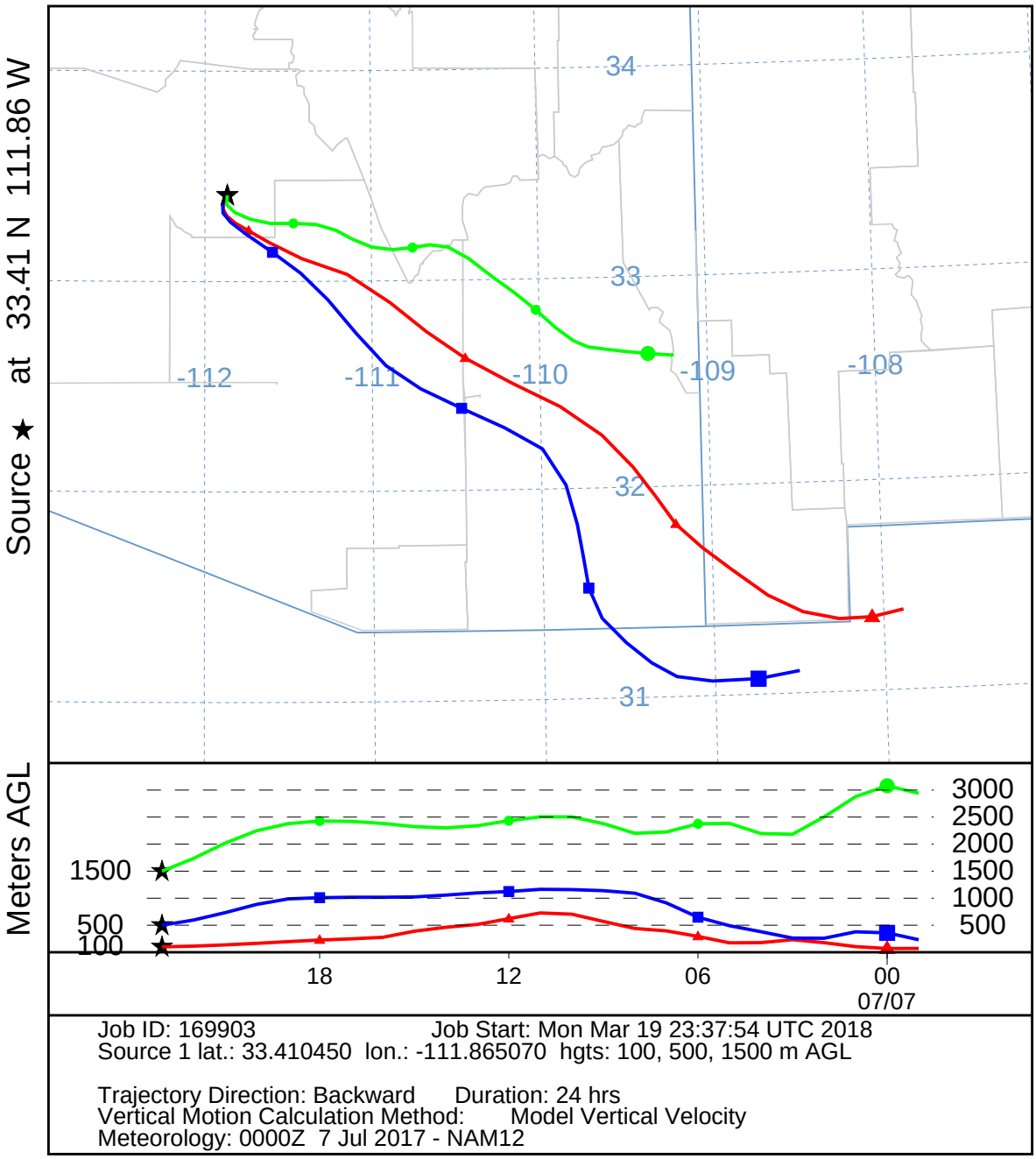


Job ID: 169847 Job Start: Mon Mar 19 23:36:31 UTC 2018
Source 1 lat.: 33.574540 lon.: -112.191960 hgts: 100, 500, 1500 m AGL

Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12

MESA MONITOR

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data



Job ID: 169903 Job Start: Mon Mar 19 23:37:54 UTC 2018
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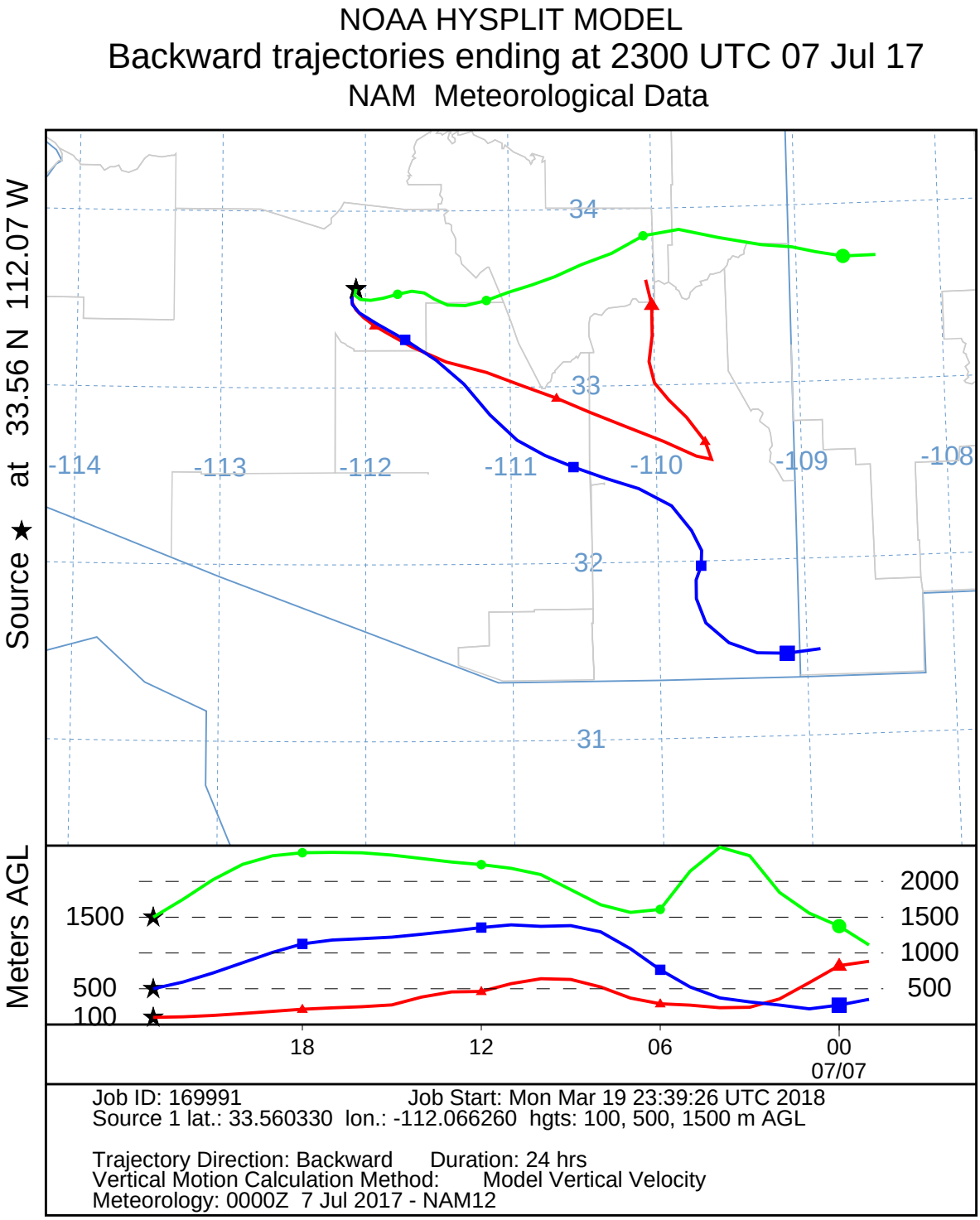
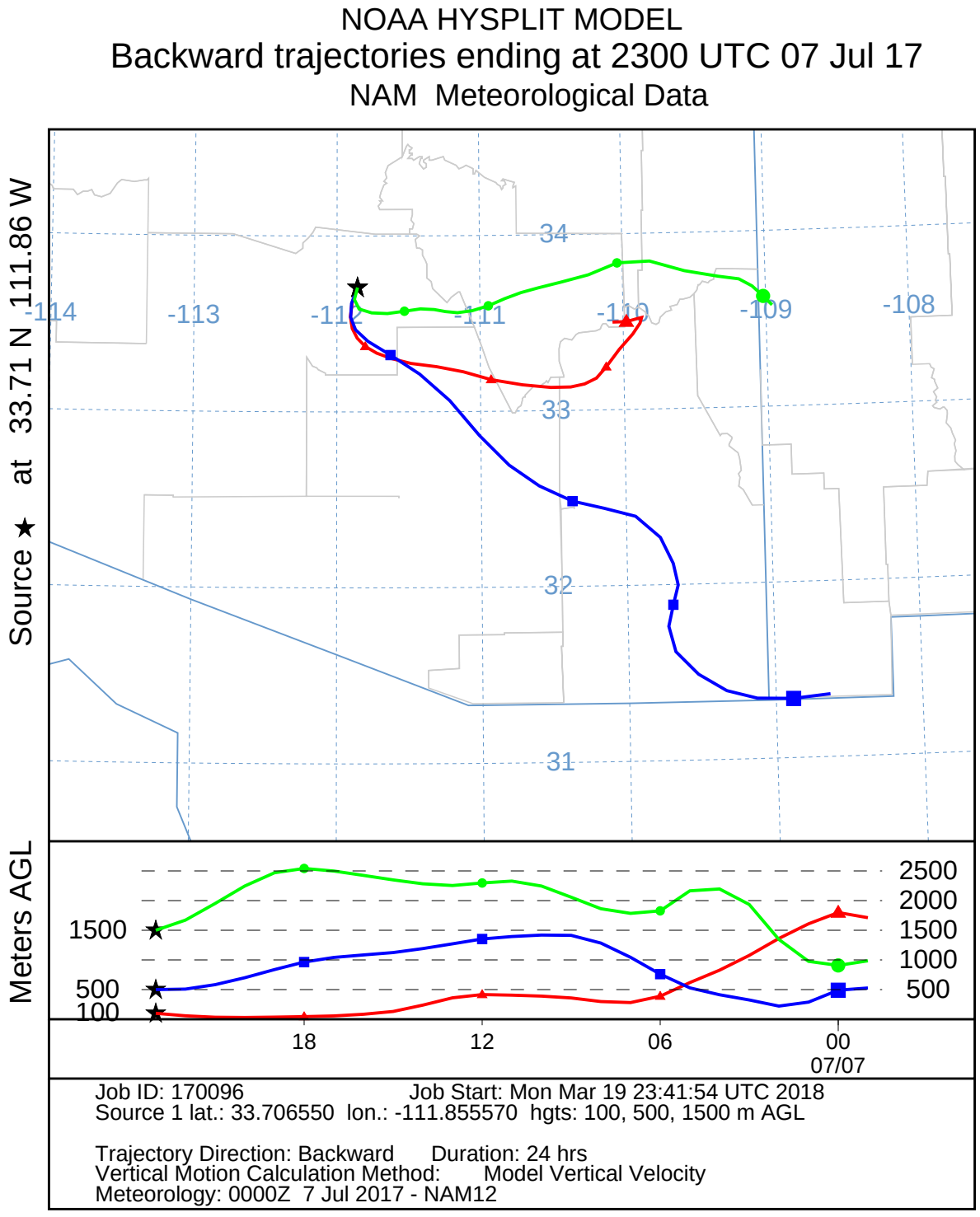
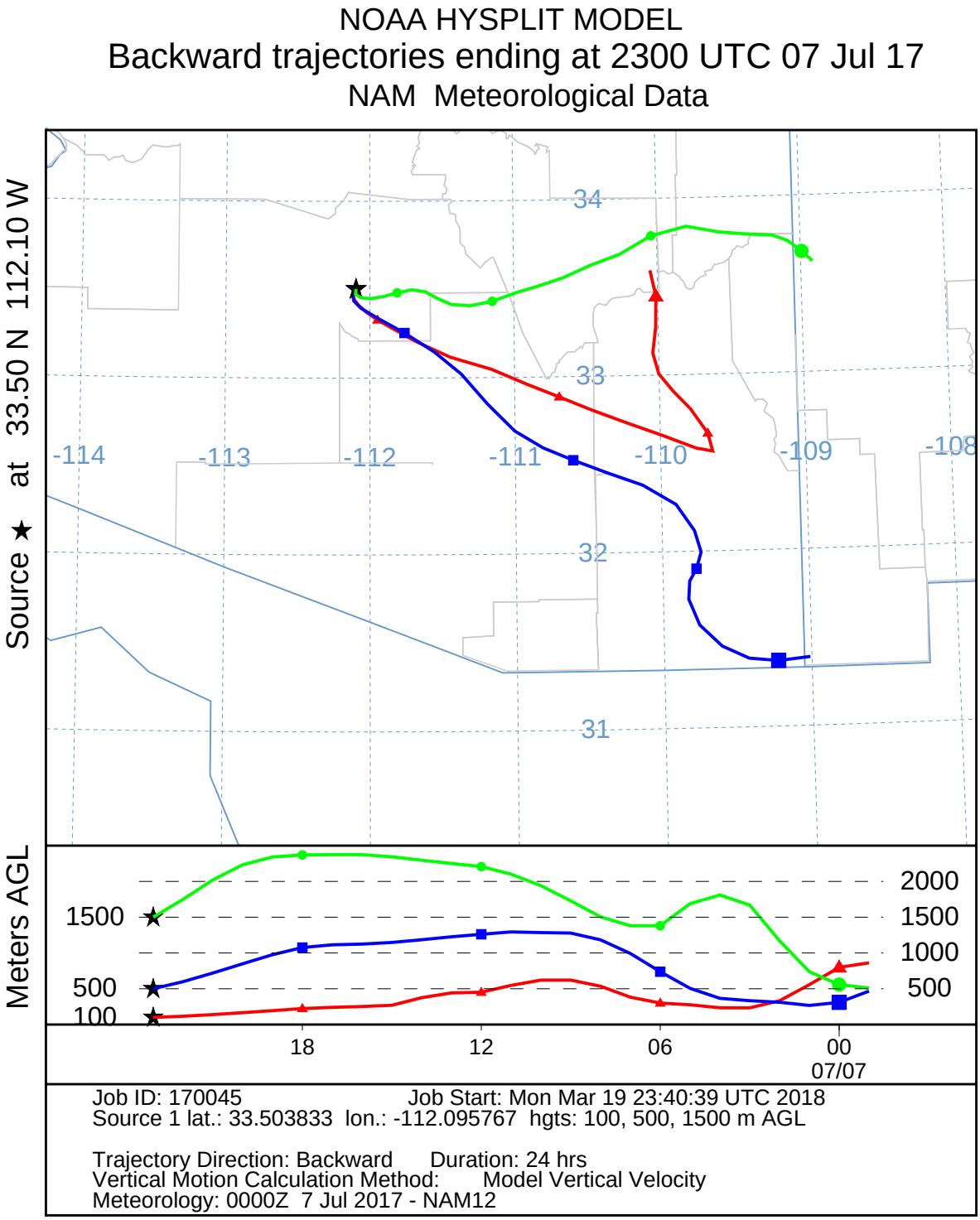
Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12

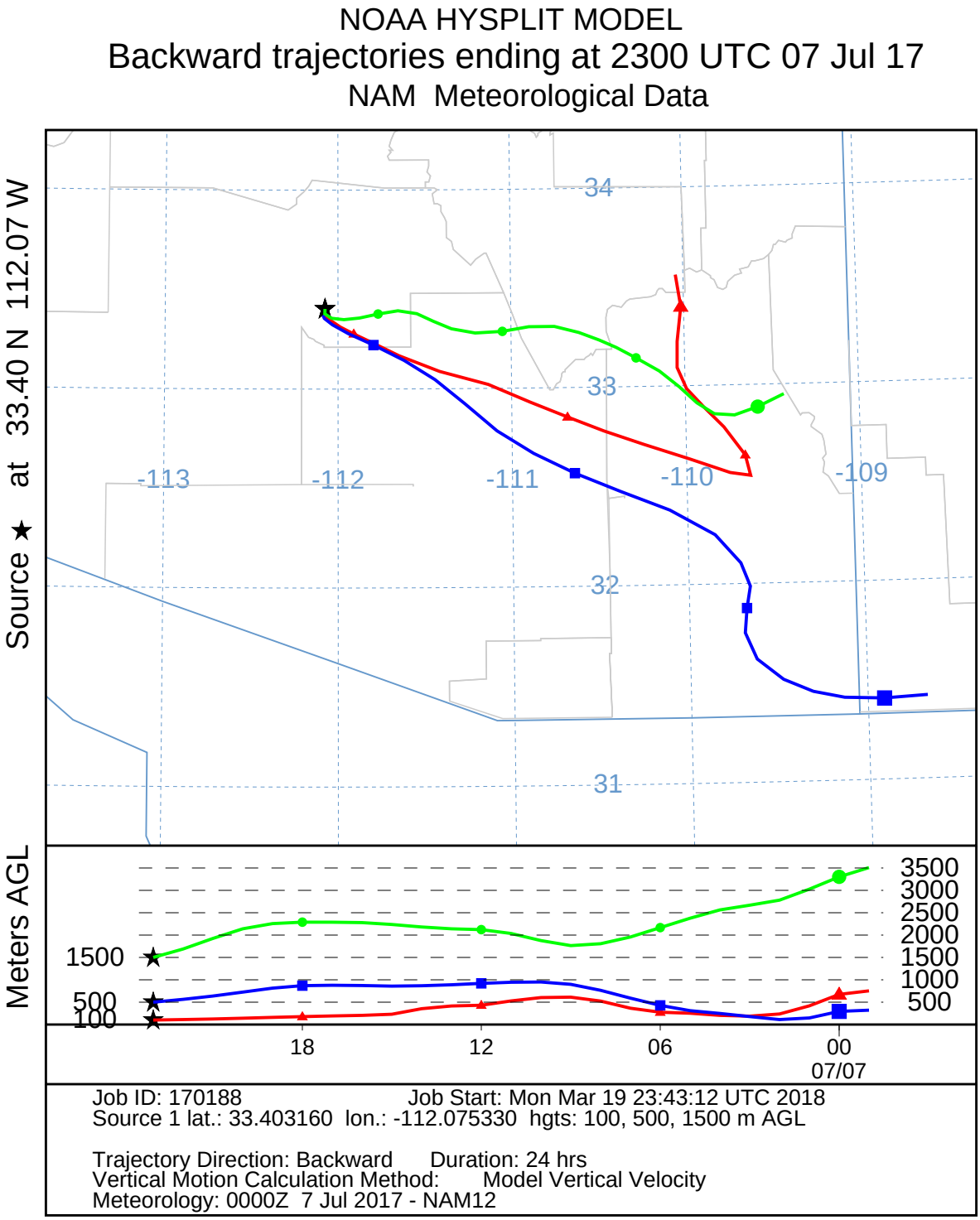

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data
Source ★ at 33.56 N 112.07 W
34
33
32
31
-114
-113
-112
-111
-110
-109
-108
Meters AGL
2000
1500
1000
500
1500
500
100
18
12
06
00
07/07
Job ID: 169991 Job Start: Mon Mar 19 23:39:26 UTC 2018
Source 1 lat.: 33.560330 lon.: -112.066260 hgts: 100, 500, 1500 m AGL
Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12

PINNACLE PEAK MONITOR

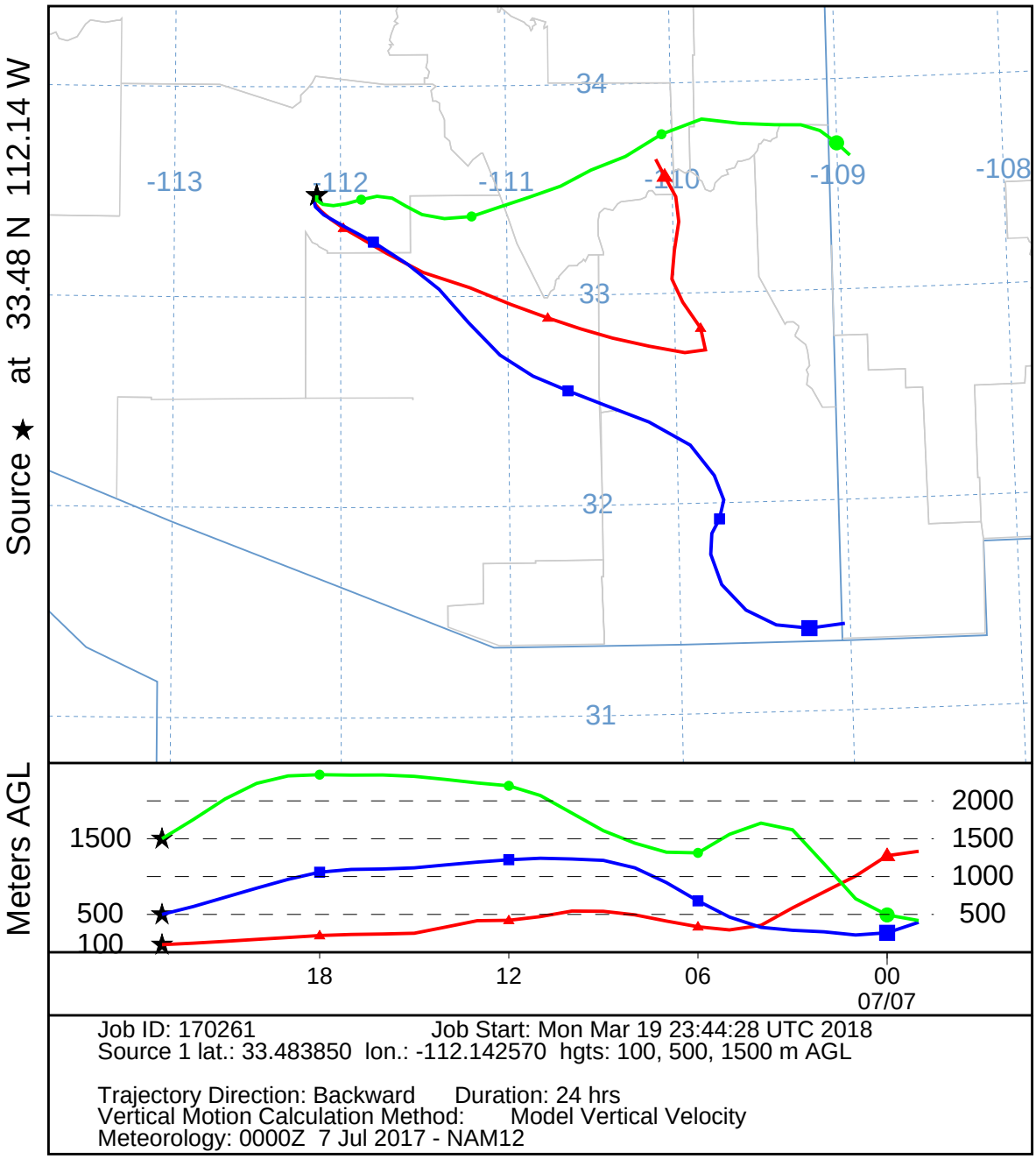


PHOENIX SUPERSITE MONITOR




NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data
Source ★ at 33.40 N 112.07 W
34
33
32
31
-113
-112
-111
-110
-109
Meters AGL
3500
3000
2500
2000
1500
1000
500
1500
500
100
18
12
06
00
07/07
Job ID: 170188 Job Start: Mon Mar 19 23:43:12 UTC 2018
Source 1 lat.: 33.403160 lon.: -112.075330 hgts: 100, 500, 1500 m AGL
Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12

NOAA HYSPLIT MODEL
Backward trajectories ending at 2300 UTC 07 Jul 17
NAM Meteorological Data



Job ID: 170261 Job Start: Mon Mar 19 23:44:28 UTC 2018
Source 1 lat.: 33.483850 lon.: -112.142570 hgts: 100, 500, 1500 m AGL

Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Meteorology: 0000Z 7 Jul 2017 - NAM12

APPENDIX C

NOAA LOCAL CLIMATOLOGICAL DATA

JULY 2017
LOCAL CLIMATOLOGICAL DATA

NOAA, National Centers for Environmental Information

PHOENIX, AZ

PHOENIX SKY HARBOR INTL AIRPORT (KPHX)
Lat:33° 25'N Long: 112° 0'W Elev (Ground) 1107 Feet
Time Zone : MOUNTAIN WBAN: 23183 ISSN#: 0198-0475

Date	Temperature °F						Deg Days BASE 65°		WEATHER	SNOW/ICE ON GND(IN)		PRECIPITATION ON GND(IN)		PRESSURE (INCHES OF HG)		WIND SPEED = MPH DIR = TENS OF DEGREES							Date
										0500 LST	1100 LST	2400 LST	2400 LST						MAXIMUM 3-SEC		2-MIN		
	MAXIMUM	MINIMUM	AVERAGE	DEP FROM NORMAL	AVERAGE DEW PT	AVERAGE WET BULB	HEATING	COOLING		DEPTH	WATER-EQUIV	SNOW-FALL	WATER EQUIV	AVERAGE STATION	AVERAGE SEA LEVEL	RESULTANT SPEED	RES DIR	AVERAGE SPEED	SPEED	DIR	SPEED	DIR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	112	80	96	4	28	61	0	31					0.00	28.59	29.70	1.5	25	8.8	26	28	22	28	01
02	110	83	97	5	38	64	0	32					0.00	28.71	29.82	3.1	26	8.3	24	28	21	28	02
03	107	88	98	6	54	70	0	33					0.00	28.72	29.85	7.3	27	8.5	29	27	18	28	03
04	111	88	100	8	48	68	0	35					0.00	28.65	29.77	6.3	27	7.8	23	23	18	27	04
05	112	87	100	8	47	68	0	35					0.00	28.66	29.77	6.0	27	9.0	30	27	21	29	05
06	111	88	100	7	51	70	0	35					0.00	28.69	29.80	1.3	32	6.2	20	28	14	17	06
07	118*	91	105*	12	47	69	0	40	VCTS				0.00	28.62	29.73	5.1	10	7.5	38	06	32	06	07
08	113	95	104	11	52	71	0	39					0.00	28.65	29.75	3.1	12	10.4	34	09	28	09	08
09	109	87	98	5	60	72	0	33					0.00	28.69	29.81	7.4	27	9.1	31	26	24	25	09
10	109	88	99	6	58	72	0	34	TS TSRA RA VCTS				0.02	28.64	29.75	5.1	27	10.6	29	16	23	16	10
11	104	82	93	0	61	72	0	28	TS RA				0.01	28.66	29.77	4.0	15	9.0	25	12	21	08	11
12	108	85	97	4	59	72	0	32					0.00	28.64	29.75	3.0	28	7.7	25	27	18	28	12
13	109	87	98	5	60	73	0	33	BLDU				0.00	28.69	29.79	4.4	24	8.7	36	17	26	17	13
14	108	86	97	4	60	72	0	32	BLDU				0.00	28.71	29.83	3.2	11	9.5	36	35	29	34	14
15	109	87	98	5	62	73	0	33	TS TSRA RA				T	28.70	29.82	2.0	13	7.3	44	34	30	34	15
16	104	74*	89	-4	66	74	0	24	TS TSRA RA HZ				0.38	28.68	29.79	2.7	18	8.1	62*	03	49*	05	16
17	99	76	88	-5	68	74	0	23	TS RA				0.05	28.66	29.79	4.2	14	7.8	23	08	18	08	17
18	103	79	91	-2	67	74	0	26	TS RA VCTS				T	28.71	29.83	3.8	12	8.2	37	13	29	13	18
19	102	82	92	-1	66	74	0	27					0.00	28.72	29.85	2.2	25	8.3	31	25	25	27	19
20	103	83	93	0	63	73	0	28	TS RA				0.01	28.72	29.84	1.8	16	7.7	28	13	22	12	20
21	103	83	93	0	65	74	0	28	TS TSRA RA VCTS				0.01	28.68	29.80	3.6	13	8.1	35	07	28	06	21
22	106	83	95	2	64	73	0	30					0.00	28.64	29.76	1.8	08	6.9	41	36	31	36	22
23	103	76	90	-3	67	74	0	25	TS RA				0.21	28.64	29.76	3.7	12	7.7	49	09	39	10	23
24	90	75	83*	-10	71	75	0	18	RA BR				0.18	28.70	29.83	3.6	10	5.8	22	07	20	07	24
25	102	80	91	-2	68	75	0	26	RA				T	28.72	29.84	1.5	11	6.1	23	01	17	28	25
26	106	84	95	2	62	73	0	30					0.00	28.71	29.84	2.3	23	6.4	21	24	16	28	26
27	110	89	100	7	58	72	0	35					0.00	28.65	29.76	1.5	03	8.3	32	16	24	08	27
28	101	85	93	0	63	73	0	28	RA				T	28.71	29.82	1.0	26	10.9	29	15	22	34	28
29	103	83	93	0	64	73	0	28	TS RA				0.02	28.72	29.84	4.2	30	6.5	43	32	32	32	29
30	99	80	90	-3	66	74	0	25					0.00	28.74	29.87	1.4	26	4.5	18	27	14	26	30
31	107	85	96	3	64	74	0	31					0.00	28.67	29.79	4.0	08	6.8	26	03	20	03	31
	106.2	83.8	95.0	¤	58.9	71.8	0.0	30.2	< MONTHLY AVERAGES | TOTALS >				0.89	28.68	29.80	0.9	21	8.0	< MONTHLY AVERAGES				
	0.1	0.3	0.2		<---------- DEPARTURE FROM NORMAL ---------->								-0.16	SUNSHINE, CLOUD, & VISIBILITY TABLES ON PAGE 3									

DEGREE DAYS

	MONTHLY TOTAL	MONTHLY DEPARTURE	SEASON TO DATE TOTAL	SEASON TO DATE DEPARTURE
HEATING :	0	0	0	0
COOLING :	937	13	2910	326

GREATEST 24-HR PRECIPITATION : 0.43 DATE : 16-17
GREATEST 24-HR SNOWFALL : DATE :
GREATEST SNOW DEPTH : DATE :

SEA LEVEL PRESSURE		DATE	TIME
MAXIMUM :	29.95	30	1012
MIMIMUM :	29.62	07	1751

NUMBER OF -> DAYS WITH

MAXIMUM TEMP >= 90 :	31	MINIMUM TEMP <= 32 :	0
MAXIMUM TEMP <= 32 :	0	MINIMUM TEMP <= 0 :	0
THUNDERSTORMS :	10	HEAVY FOG :	0

PRECIPITATION >= 0.01 INCH:	9
PRECIPITATION >= 0.10 INCH:	3
SNOWFALL >= 1.0 INCH :	

JULY 2017
PHOENIX, AZ

HOURLY PRECIPITATION
(WATER EQUIVALENT IN INCHES)

PHOENIX, AZ (KPHX)
JULY 2017

WBAN # 23183

Date	FOR HOUR (LST) ENDING AT												Date	FOR HOUR (LST) ENDING AT												Date	Sum of Hourly Data	2400 LST Water Equiv.
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	23	24				
01													01													01	0.00	0.00
02													02													02	0.00	0.00
03													03													03	0.00	0.00
04													04													04	0.00	0.00
05													05													05	0.00	0.00
06													06													06	0.00	0.00
07													07													07	0.00	0.00
08													08													08	0.00	0.00
09													09													09	0.00	0.00
10													10												0.02	10	0.02	0.02
11	0.01												11													11	0.01	0.01
12													12													12	0.00	0.00
13													13													13	0.00	0.00
14													14													14	0.00	0.00
15													15							T			T	T	15	T	T
16													16											0.32	0.06	16	0.38	0.38
17	0.01	0.03	0.01										17													17	0.05	0.05
18													18						T	T						18	T	T
19													19													19	0.00	0.00
20													20											T	0.01	20	0.01	0.01
21	T												21								0.01					21	0.01	0.01
22													22													22	0.00	0.00
23													23								0.16	0.03	T	0.01	0.01	23	0.21	0.21
24						T	0.01			0.02	0.15	T	24													24	0.18	0.18
25		T											25													25	T	T
26													26													26	0.00	0.00
27													27													27	0.00	0.00
28									T	T			28													28	T	T
29					T	0.01							29												0.01	29	0.02	0.02
30													30													30	0.00	0.00
31													31													31	0.00	0.00

*** Indicates sum of Hourly and Daily disagree.**

MAXIMUM SHORT DURATION PRECIPITATION (See Note)

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (Inches)	0.13	0.20	0.25	0.29	0.34	0.38	0.38	0.38	0.38	0.39	0.39	0.41
Ending Date	16	16	16	16	16	16	16	16	16	17	17	17
Ending Time (Hr/Min)	2247	2251	2254	2254	2302	2315	2315	2315	2315	0018	0018	0125

Date and time are not entered for TRACE amounts.

Note : The hourly and daily precipitation totals are printed in the last 2 columns and hi-lighted in red when they disagree. NWS does not edit ASOS hourly values but may edit daily and monthly totals. Hourly, daily, and monthly totals are printed as reported by the ASOS site.

REFERENCE NOTES & SUPPLEMENTAL SUMMARIES

*** = Extreme for the month (last occurence if more than one).**

T = Trace precipitation amount.

+ = also occurs on earlier date.

FG+ = Heavy fog, visibility .25 miles or less.

BLANK entries denote missing or unreported data.

Resultant wind is the vector sum of the wind speeds and directions divided by the number of observations.

Wind direction is recorded in tens of degrees (2 digits) clockwise from true north. '00' = calm, 'VR' = variable.

Precipitation is for the 24-hour period ending at the time indicated in the column heading.

Ceilometer (30-second) data are used to derive cloudiness at or below 12,000 feet. This cloudiness is the mean cloud cover detected during sunrise to sunset (SR-SS), or midnight to midnight (MN-MN).

WEATHER NOTATIONS

QUALIFIER	WEATHER PHENOMENA		
DESCRIPTOR	PRECIPITATION	OBSCURATION	OTHER
BC Patches	DZ Drizzle	BR Mist	DS Duststorm
BL Blowing	GR Hail	DU Widespread Dust	FC Funnel Cloud
DR Low Drifting	GS Small Hail and/or Snow Pellets	FG Fog	+FC Tornado Waterspout
FZ Freezing	IC Ice Crystals	FU Smoke	PO Well-Developed Dust/Sand Whirls
MI Shallow	PL Ice Pellets	HZ Haze	
PR Partial	RA Rain		
SH Shower(s)	SG Snow Grains	PY Spray	SQ Squalls
TS Thunderstorm	SN Snow	SA Sand	SS Sandstorm
VC In the Vicinity	UP Unkown Precipitation	VA Volcanic Ash	GL Glaze

Intensity (as indicated on pages 4 to 6):
'+' = Heavy ' ' = Moderate '-' = Light

PHOENIX, AZ
JULY 2017

Sky Condition is based on the sum (not to exceed 8) of the sunrise to sunset cloud cover below and above 12,000 feet.

Clear = 0-2 oktas, Partly Cloudy = 3-6 oktas, Cloudy = 7-8 oktas.

A Heating (Cooling) Degree Day is the difference between the average daily temperature and 65 degrees F. The HDD season begins July 1, the CDD season begins January 1.

Snow Depth, Snowfall, and Sunshine data may come from nearby sites that the National Weather Service deems Climatologically representative of this site.

NORMALS ARE FOR THE YEARS 1981-2010

ADDITIONAL NOTES & ERRATA:

```
Station Augmentation-CONTRACTOR
  Lat/Lon:33.4442/-112.0247 Elevation:1107ft
  Distance:.5mi Dir:N
  Augmented Elements:TEMP, PRECIP
  Equipment:MXMN, SRG
```

Date	VISIBILITY (MILES) MINIMUM	VISIBILITY (MILES) MAXIMUM
01	10.00	10.00
02	10.00	10.00
03	10.00	10.00
04	10.00	10.00
05	10.00	10.00
06	10.00	10.00
07	10.00	10.00
08	10.00	10.00
09	10.00	10.00
10	10.00	10.00
11	10.00	10.00
12	8.00	10.00
13	6.00	10.00
14	6.00	10.00
15	9.00	10.00
16	1.75	10.00
17	10.00	10.00
18	10.00	10.00
19	10.00	10.00
20	10.00	10.00
21	10.00	10.00
22	10.00	10.00
23	3.00	10.00
24	4.00	10.00
25	9.00	10.00
26	10.00	10.00
27	10.00	10.00
28	10.00	10.00
29	10.00	10.00
30	10.00	10.00
31	10.00	10.00
AVGS	8.93	10.00

MINIMUM VISIBILTY (MILES)

<= .25	<= 3.0	>= 7.0
0	2	26

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2017 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F			RELATIVE HUMIDITY (PCT)	WIND		PRESSURE (INCHES, HG)	
					DRY BULB	DEW POINT	WET BULB		SPEED (MPH)	DIRECTION Tens of Deg	STATION	SEA LEVEL
				SUNRISE: 0522 JUL 01 SUNSET: 1942								
02	CLR	NC	10.00		86	35	59	16	5	08	28.56	29.66
05	FEW	250	10.00		81	23	54	12	9	10	28.59	29.70
08	CLR	NC	10.00		87	31	58	13	8	10	28.64	29.75
11	CLR	NC	10.00		99	34	63	10	3	VR	28.64	29.74
14	CLR	NC	10.00		106	27	64	6	5	VR	28.60	29.70
17	CLR	NC	10.00		110	29	66	6	7	30	28.54	29.64
20	FEW	230	10.00		104	16	61	4	20	28	28.57	29.67
23	FEW	140	10.00		97	21	59	6	14	27	28.64	29.74
				SUNRISE: 0522 JUL 02 SUNSET: 1942								
02	FEW	140	10.00		92	24	58	8	5	01	28.65	29.75
05	FEW	150	10.00		85	32	58	15	7	13	28.70	29.82
08	FEW	150	10.00		89	31	59	12	10	14	28.77	29.88
11	FEW	150	10.00		100	35	64	10	8	13	28.79	29.90
14	FEW	250	10.00		107	39	67	10	13	27	28.73	29.84
17	FEW	250	10.00		106	41	67	11	8	33	28.66	29.78
20	FEW	160	10.00		103	46	68	15	14	26	28.66	29.78
23	FEW	160	10.00		97	50	68	20	9	26	28.72	29.83
				SUNRISE: 0523 JUL 03 SUNSET: 1942								
02	BKN	250	10.00		93	51	67	24	11	26	28.75	29.86
05	SCT	200	10.00		89	53	67	29	6	30	28.79	29.90
08	FEW	250	10.00		92	57	70	31	3	26	28.83	29.94
11	FEW	250	10.00		97	59	72	28	3	VR	28.81	29.93
14	FEW	150	10.00		102	53	71	19	6	VR	28.75	29.86
17	FEW	120	10.00		107	53	72	17	16	26	28.66	29.78
20	FEW	200	10.00		103	52	70	18	14	26	28.64	29.75
23	CLR	NC	10.00		97	53	69	23	6	26	28.66	29.78
				SUNRISE: 0523 JUL 04 SUNSET: 1941								
02	CLR	NC	10.00		94	51	67	23	9	26	28.68	29.78
05	SCT	230	10.00		91	55	68	30	5	33	28.69	29.80
08	CLR	NC	10.00		93	55	69	28	6	10	28.76	29.87
11	FEW	170	10.00		100	51	69	19	0	00	28.75	29.85
14	FEW	170	10.00		108	48	70	13	9	30	28.68	29.78
17	FEW	120	10.00		110	42	69	10	11	30	28.60	29.70
20	SCT	230	10.00		106	39	67	10	9	25	28.58	29.68
23	SCT	150	10.00		100	42	66	14	10	27	28.61	29.71
				SUNRISE: 0524 JUL 05 SUNSET: 1941								
02	SCT	210	10.00		92	45	64	20	5	21	28.62	29.72
05	BKN	210	10.00		87	50	65	28	7	11	28.68	29.78
08	SCT	220	10.00		91	54	68	28	7	11	28.76	29.87
11	FEW	220	10.00		102	53	71	19	13	31	28.76	29.87
14	FEW	120	10.00		108	47	70	13	13	30	28.69	29.79
17	FEW	120	10.00		112	43	70	10	16	26	28.60	29.70
20	BKN	250	10.00		108	42	68	11	10	25	28.60	29.70
23	CLR	NC	10.00		100	47	68	16	8	24	28.65	29.75
				SUNRISE: 0524 JUL 06 SUNSET: 1941								
02	FEW	180	10.00		94	47	66	20	0	00	28.66	29.77
05	BKN	220	10.00		89	58	69	35	8	09	28.72	29.83
08	FEW	200	10.00		93	58	70	31	6	VR	28.81	29.92
11	FEW	200	10.00		101	56	72	22	7	25	28.79	29.90
14	FEW	120	10.00		108	50	71	14	3	26	28.70	29.81
17	FEW	120	10.00		110	47	70	12	11	30	28.62	29.72
20	BKN	220	10.00		108	46	70	12	7	26	28.61	29.71
23	SCT	150	10.00		103	45	68	14	7	17	28.65	29.75

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F			RELATIVE HUMIDITY (PCT)	WIND		PRESSURE (INCHES, HG)	
					DRY BULB	DEW POINT	WET BULB		SPEED (MPH)	DIRECTION Tens of Deg	STATION	SEA LEVEL
				SUNRISE: 0525 JUL 07 SUNSET: 1941								
02	BKN	220	10.00		96	51	68	22	6	14	28.64	29.74
05	BKN	220	10.00		94	52	68	24	0	00	28.65	29.75
08	FEW	250	10.00		96	52	68	23	7	10	28.69	29.80
11	SCT	250	10.00		108	49	71	14	7	VR	28.69	29.80
14	FEW	250	10.00		114	44	71	10	5	VR	28.62	29.72
17	BKN	250	10.00		115	42	70	9	7	15	28.54	29.64
20	BKN	220	10.00		111	38	68	8	9	12	28.55	29.65
23	BKN	170	10.00		105	46	69	14	8	12	28.63	29.72
				SUNRISE: 0525 JUL 08 SUNSET: 1941								
02	BKN	170	10.00		102	47	68	15	13	10	28.61	29.71
05	BKN	170	10.00		97	49	67	20	7	11	28.65	29.75
08	SCT	180	10.00		98	53	69	22	11	14	28.71	29.82
11	SCT	200	10.00		105	56	73	20	13	12	28.71	29.82
14	SCT	200	10.00		112	53	73	14	9	21	28.65	29.75
17	BKN	190	10.00		111	50	72	13	11	04	28.58	29.67
20	BKN	180	10.00		105	50	70	16	7	05	28.59	29.69
23	OVC	270	10.00		99	59	72	27	20	27	28.69	29.79
				SUNRISE: 0526 JUL 09 SUNSET: 1941								
02	BKN	270	10.00		95	60	72	31	7	26	28.71	29.81
05	BKN	270	10.00		91	62	72	38	17	28	28.75	29.86
08	SCT	250	10.00		89	64	72	43	8	31	28.79	29.91
11	BKN	250	10.00		97	61	73	30	3	27	28.78	29.89
14	SCT	180	10.00		103	59	73	24	7	VR	28.69	29.79
17	SCT	200	10.00		107	55	73	18	6	27	28.59	29.69
20	BKN	220	10.00		105	54	72	18	11	26	28.61	29.71
23	BKN	230	10.00		96	62	73	32	11	28	28.66	29.77
				SUNRISE: 0526 JUL 10 SUNSET: 1940								
02	BKN	230	10.00	VCTS	94	62	73	35	7	30	28.69	29.79
05	OVC	250	10.00		90	60	70	37	7	30	28.69	29.79
08	BKN	230	10.00		93	60	71	33	7	10	28.70	29.81
11	SCT	230	10.00		98	58	72	26	5	34	28.70	29.82
14	SCT	230	10.00		105	55	72	19	11	27	28.63	29.73
17	SCT	230	10.00		108	55	73	17	16	28	28.54	29.64
20	SCT	150	10.00		105	53	71	18	17	27	28.54	29.64
23	BKN	250	10.00	TS	98	59	72	27	18	14	28.64	29.74
				SUNRISE: 0527 JUL 11 SUNSET: 1940								
02	BKN	250	10.00		85	67	73	55	14	13	28.68	29.78
05	BKN	250	10.00		84	64	71	51	10	14	28.71	29.82
08	BKN	250	10.00		85	65	72	51	15	14	28.74	29.85
11	BKN	250	10.00		93	63	73	37	7	04	28.73	29.84
14	BKN	250	10.00		100	61	74	28	8	27	28.66	29.76
17	BKN	250	10.00		101	58	72	24	10	29	28.58	29.69
20	BKN	250	10.00		101	56	72	22	0	00	28.59	29.70
23	SCT	250	10.00		93	57	70	30	8	15	28.64	29.75
				SUNRISE: 0527 JUL 12 SUNSET: 1940								
02	SCT	250	10.00		90	60	70	37	3	12	28.63	29.74
05	SCT	180	10.00		87	61	70	42	6	09	28.66	29.78
08	FEW	180	10.00		91	62	72	38	3	12	28.70	29.81
11	FEW	180	10.00		97	59	72	28	0	00	28.70	29.81
14	SCT	250	10.00		107	58	74	20	13	23	28.64	29.74
17	SCT	250	10.00		107	56	73	19	13	26	28.58	29.68
20	SCT	180	10.00		102	55	71	21	13	33	28.59	29.69
23	SCT	250	10.00		99	61	73	29	16	27	28.66	29.77

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2017 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0528 JUL 13 SUNSET: 1940								
02	SCT	250	10.00		93	63	73	37	7	14	28.69	29.80
05	SCT	250	10.00		87	64	72	46	3	09	28.71	29.83
08	FEW	250	10.00		92	63	73	38	6	30	28.75	29.86
11	SCT	250	10.00		97	63	74	33	7	27	28.75	29.86
14	SCT	250	10.00		105	60	74	23	11	24	28.69	29.79
17	SCT	250	10.00		108	56	73	18	13	26	28.61	29.72
20	SCT	250	10.00		105	56	73	20	13	26	28.61	29.71
23	BKN	250	10.00		100	58	72	25	7	24	28.68	29.78
				SUNRISE: 0528 JUL 14 SUNSET: 1939								
02	BKN	200	10.00		89	65	73	45	18	15	28.73	29.84
05	BKN	200	10.00		86	62	70	45	8	11	28.76	29.87
08	SCT	250	10.00		90	62	71	39	3	10	28.78	29.89
11	FEW	250	10.00		97	61	73	30	5	09	28.77	29.88
14	FEW	250	10.00		103	58	73	23	6	03	28.70	29.81
17	BKN	250	10.00		107	58	74	20	3	VR	28.65	29.75
20	BKN	200	10.00		99	55	71	23	13	13	28.65	29.75
23	BKN	250	10.00		92	62	72	37	14	12	28.69	29.80
				SUNRISE: 0529 JUL 15 SUNSET: 1939								
02	BKN	200	10.00		91	62	72	38	8	12	28.71	29.82
05	BKN	200	10.00		90	63	72	41	7	10	28.73	29.84
08	BKN	220	10.00		92	64	73	40	8	16	28.77	29.88
11	FEW	250	10.00		101	62	74	28	8	18	28.75	29.86
14	FEW	250	10.00		107	60	75	22	7	20	28.68	29.78
17	BKN	250	10.00		106	60	75	22	7	35	28.62	29.72
20	SCT	130	10.00		95	65	74	37	11	05	28.66	29.78
23	BKN	140	10.00		88	65	73	46	0	00	28.71	29.83
				SUNRISE: 0530 JUL 16 SUNSET: 1938								
02	BKN	210	10.00		86	67	73	53	8	14	28.75	29.87
05	SCT	180	10.00		84	70	74	63	10	12	28.72	29.83
08	BKN	210	10.00		87	69	75	55	7	15	28.77	29.88
11	SCT	250	10.00		94	67	75	41	6	VR	28.74	29.85
14	SCT	190	10.00		100	64	75	31	9	26	28.65	29.76
17	SCT	210	10.00		102	61	74	26	8	22	28.58	29.68
20	SCT	180	10.00		101	62	74	28	8	27	28.59	29.70
23	OVC	100	1.75	TS+RA	73	70	71	89	13	05	28.71	29.83
				SUNRISE: 0530 JUL 17 SUNSET: 1938								
02	OVC	150	10.00	-RA	77	71	73	82	15	10	28.71	29.83
05	BKN	180	10.00		79	70	73	74	5	03	28.68	29.78
08	BKN	160	10.00		81	69	73	67	7	12	28.73	29.85
11	BKN	190	10.00		85	68	73	57	8	10	28.73	29.86
14	SCT	190	10.00		95	64	74	36	5	30	28.66	29.77
17	SCT	190	10.00		98	64	75	33	11	21	28.59	29.70
20	SCT	190	10.00		97	63	74	33	7	18	28.61	29.72
23	SCT	150	10.00		90	67	74	47	9	14	28.66	29.78
				SUNRISE: 0531 JUL 18 SUNSET: 1937								
02	BKN	250	10.00		84	63	70	49	13	13	28.70	29.82
05	BKN	180	10.00		79	68	72	69	9	11	28.73	29.84
08	SCT	190	10.00		86	68	74	55	3	09	28.76	29.88
11	SCT	250	10.00		92	67	75	44	0	00	28.75	29.87
14	SCT	250	10.00		98	66	76	35	5	26	28.69	29.80
17	BKN	250	10.00		99	66	76	34	13	11	28.65	29.76
20	SCT	160	10.00		86	68	74	55	11	01	28.69	29.82
23	BKN	200	10.00		86	66	73	51	5	30	28.74	29.85

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0532 JUL 19 SUNSET: 1937								
02	BKN	270	10.00		86	67	73	53	5	11	28.74	29.85
05	BKN	220	10.00		85	69	74	59	5	12	28.75	29.86
08	SCT	250	10.00		88	70	75	55	7	09	28.79	29.91
11	SCT	190	10.00		95	69	77	43	5	14	28.78	29.89
14	BKN	250	10.00		99	66	76	34	6	03	28.71	29.82
17	BKN	200	10.00		98	60	73	28	21	27	28.69	29.80
20	BKN	200	10.00		97	63	74	33	9	31	28.69	29.80
23	BKN	250	10.00		94	64	74	37	5	25	28.71	29.82
				SUNRISE: 0532 JUL 20 SUNSET: 1937								
02	BKN	210	10.00		88	67	74	50	11	15	28.74	29.86
05	BKN	210	10.00		86	65	72	49	5	17	28.76	29.87
08	BKN	170	10.00		86	64	71	48	6	13	28.81	29.93
11	SCT	160	10.00		93	61	72	34	6	08	28.81	29.93
14	SCT	200	10.00		100	61	74	28	8	27	28.72	29.83
17	SCT	250	10.00		101	60	73	26	9	30	28.64	29.74
20	BKN	250	10.00		97	62	73	32	9	01	28.66	29.76
23	BKN	200	10.00		86	68	74	55	8	20	28.73	29.85
				SUNRISE: 0533 JUL 21 SUNSET: 1936								
02	BKN	200	10.00		85	68	73	57	10	12	28.72	29.83
05	SCT	150	10.00		84	68	73	59	9	14	28.71	29.83
08	SCT	160	10.00		87	68	74	53	7	12	28.75	29.87
11	BKN	160	10.00		95	66	75	39	6	VR	28.76	29.87
14	SCT	250	10.00		100	61	74	28	5	VR	28.68	29.78
17	SCT	250	10.00		102	60	74	25	7	27	28.60	29.70
20	BKN	250	10.00	-RA	89	69	75	52	9	09	28.62	29.72
23	BKN	180	10.00		88	68	74	52	7	11	28.66	29.78
				SUNRISE: 0534 JUL 22 SUNSET: 1935								
02	SCT	160	10.00		89	67	74	48	9	07	28.66	29.77
05	SCT	160	10.00		86	68	74	55	9	09	28.68	29.79
08	BKN	200	10.00		88	68	74	52	5	17	28.70	29.82
11	SCT	200	10.00		95	62	73	34	5	29	28.70	29.82
14	SCT	200	10.00		101	58	72	24	6	VR	28.62	29.72
17	BKN	200	10.00		103	58	73	23	7	30	28.58	29.68
20	BKN	210	10.00		93	63	73	37	3	27	28.62	29.72
23	BKN	270	10.00		93	66	74	41	9	08	28.65	29.76
				SUNRISE: 0534 JUL 23 SUNSET: 1935								
02	BKN	270	10.00		87	68	74	53	9	11	28.64	29.75
05	BKN	250	10.00		86	68	74	55	9	13	28.66	29.76
08	BKN	190	10.00		88	69	75	54	8	09	28.69	29.80
11	BKN	250	10.00		95	64	74	36	0	00	28.69	29.80
14	SCT	250	10.00		99	62	74	30	3	VR	28.62	29.72
17	SCT	250	10.00		101	61	74	27	7	30	28.56	29.66
20	BKN	120	3.00		77	72	74	83	20	15	28.69	29.81
23	BKN	130	10.00		77	72	74	85	10	08	28.71	29.83
				SUNRISE: 0535 JUL 24 SUNSET: 1934								
02	BKN	170	10.00		78	72	74	82	7	13	28.69	29.80
05	BKN	170	10.00		80	72	74	76	3	12	28.71	29.82
08	BKN	080	10.00		77	72	74	85	14	08	28.74	29.87
11	BKN	090	7.00		75	72	73	90	8	06	28.77	29.90
14	BKN	200	10.00		85	72	76	65	6	29	28.71	29.84
17	SCT	130	10.00		90	72	77	56	3	VR	28.66	29.77
20	BKN	220	10.00		88	68	74	52	3	19	28.66	29.78
23	BKN	250	10.00		87	71	76	59	7	15	28.70	29.83

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2017 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0536		JUL 25		SUNSET: 1934							
02	BKN	110	9.00		83	74	77	74	0	00	28.71	29.84
05	BKN	230	10.00		82	75	77	79	9	08	28.72	29.84
08	BKN	130	10.00		85	73	77	68	7	09	28.76	29.88
11	BKN	130	10.00		94	70	77	46	7	15	28.77	29.89
14	BKN	250	10.00		101	63	75	29	7	22	28.72	29.84
17	BKN	210	10.00		98	64	75	33	6	VR	28.69	29.81
20	SCT	210	10.00		98	59	72	27	7	33	28.69	29.80
23	CLR	NC	10.00		90	68	75	48	7	10	28.72	29.83
	SUNRISE: 0536		JUL 26		SUNSET: 1933							
02	CLR	NC	10.00		87	68	74	53	3	24	28.74	29.86
05	FEW	250	10.00		85	68	73	57	0	00	28.76	29.87
08	SCT	250	10.00		89	67	74	48	9	09	28.80	29.92
11	FEW	250	10.00		98	60	73	28	3	05	28.79	29.91
14	SCT	250	10.00		105	59	74	22	14	24	28.72	29.83
17	SCT	270	10.00		103	56	72	21	3	VR	28.66	29.77
20	BKN	250	10.00		101	57	72	23	8	26	28.66	29.76
23	CLR	NC	10.00		95	64	74	36	5	22	28.68	29.79
	SUNRISE: 0537		JUL 27		SUNSET: 1932							
02	SCT	200	10.00		95	58	71	29	8	29	28.68	29.78
05	SCT	180	10.00		89	59	70	36	0	00	28.69	29.80
08	FEW	250	10.00		91	58	70	33	6	32	28.71	29.83
11	SCT	250	10.00		100	56	71	23	3	VR	28.69	29.80
14	BKN	250	10.00		106	55	72	19	8	32	28.63	29.72
17	BKN	200	10.00		107	54	72	17	0	00	28.58	29.68
20	BKN	200	10.00		99	61	73	29	16	08	28.59	29.69
23	OVC	200	10.00		94	62	73	35	13	10	28.66	29.77
	SUNRISE: 0538		JUL 28		SUNSET: 1932							
02	BKN	210	10.00		90	64	73	42	16	14	28.69	29.79
05	BKN	250	10.00		86	65	72	49	9	15	28.73	29.84
08	BKN	180	10.00		86	66	73	51	8	11	28.76	29.88
11	BKN	190	10.00		90	66	74	45	6	15	28.75	29.87
14	BKN	180	10.00		97	63	74	33	9	32	28.69	29.80
17	SCT	180	10.00		100	59	73	26	11	28	28.64	29.75
20	BKN	180	10.00		94	60	72	32	21	34	28.69	29.80
23	BKN	170	10.00		89	63	72	42	7	33	28.72	29.84
	SUNRISE: 0538		JUL 29		SUNSET: 1931							
02	BKN	200	10.00		88	63	71	43	0	00	28.72	29.83
05	BKN	200	10.00		88	67	74	50	0	00	28.72	29.83
08	BKN	200	10.00		86	67	73	53	7	22	28.75	29.87
11	BKN	250	10.00		93	64	73	38	5	08	28.76	29.88
14	BKN	250	10.00		99	60	73	28	7	27	28.70	29.82
17	SCT	150	10.00		102	59	73	24	15	29	28.65	29.76
20	BKN	250	10.00		86	66	73	51	0	00	28.74	29.86
23	BKN	170	10.00		86	65	72	49	13	31	28.78	29.90
	SUNRISE: 0539		JUL 30		SUNSET: 1930							
02	BKN	250	10.00		83	69	73	63	3	10	28.75	29.87
05	OVC	250	10.00		82	68	73	63	7	29	28.77	29.88
08	BKN	180	10.00		83	69	73	63	3	01	28.82	29.94
11	BKN	160	10.00		89	68	75	50	6	14	28.82	29.94
14	SCT	180	10.00		96	65	75	36	8	29	28.75	29.86
17	BKN	210	10.00		97	65	75	35	3	VR	28.69	29.80
20	SCT	170	10.00		96	65	75	36	5	21	28.69	29.80
23	BKN	170	10.00		95	63	73	35	3	31	28.72	29.83

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0540		JUL 31		SUNSET: 1929							
02	OVC	220	10.00		93	64	73	38	9	07	28.70	29.81
05	BKN	220	10.00		90	65	73	44	8	09	28.70	29.81
08	BKN	230	10.00		91	67	74	45	8	15	28.74	29.85
11	BKN	150	10.00		96	65	75	36	0	00	28.73	29.85
14	FEW	150	10.00		101	63	75	29	8	29	28.66	29.78
17	SCT	250	10.00		105	59	74	22	3	35	28.61	29.71
20	SCT	150	10.00		99	61	73	29	11	05	28.63	29.73
23	SCT	150	10.00		97	62	73	32	9	08	28.66	29.77

3-HOURLY OBSERVATION NOTES

Sky Cover is the amount of the sky obscured. CLR or SKC = 0, FEW = 1/8-2/8, SCT = 3/8-4/8, BKN = 5/8-7/8, OVC = 8/8, W = Vertical Visibility = 8/8

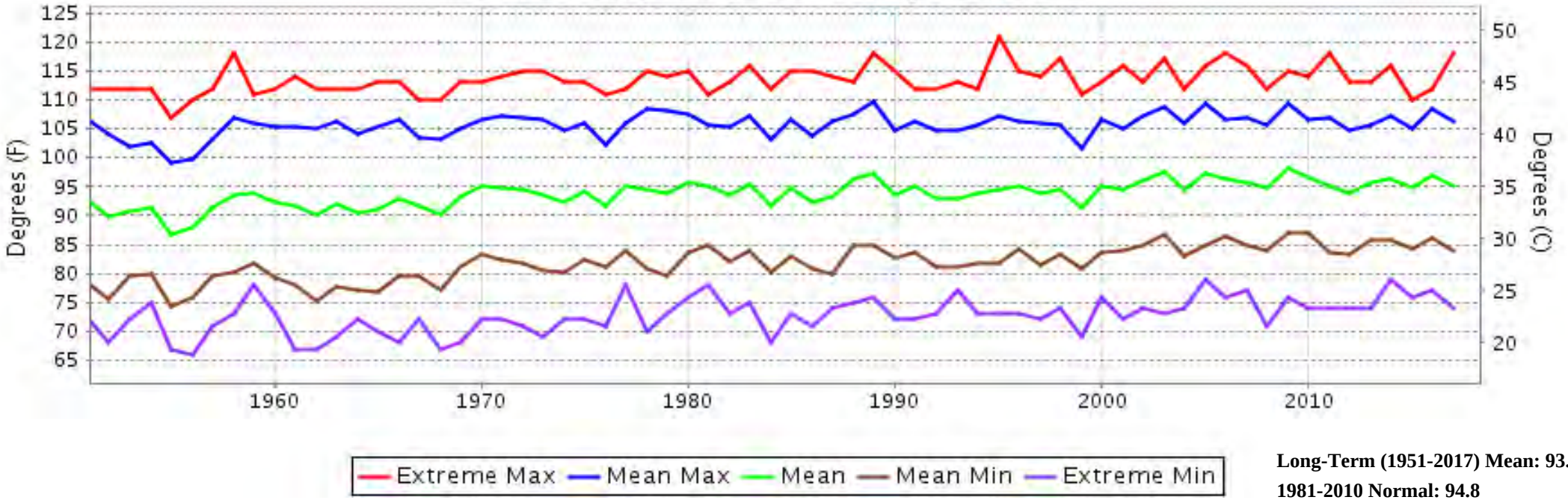
Ceiling is reported in hundreds of feet above ground level for clouds at or below 12,000 feet. NC = No Ceiling detected.

& = Original observation containted additional weather elements.
See page 3 for additional notes.

SUMMARY BY HOUR

HOUR (LST)	AVERAGES DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY	PRESSURE (Inches, HG) STATION	SEA LEVEL	VISIBILITY (Miles)	WIND SPEED (MPH)	RESULTANT WIND (MPH) SPEED	DIRECTION
01	90	60	71	41	28.69	29.80	10.00	8	4	13
02	89	60	71	42	28.69	29.80	9.97	8	4	13
03	88	60	70	43	28.69	29.80	10.00	7	5	12
04	87	61	70	44	28.70	29.80	10.00	7	6	12
05	86	61	70	46	28.71	29.82	10.00	7	4	13
06	86	61	70	47	28.72	29.84	10.00	7	5	12
07	87	62	71	46	28.74	29.85	10.00	7	5	12
08	89	62	71	44	28.75	29.87	10.00	7	5	12
09	91	62	72	41	28.76	29.87	10.00	6	5	13
10	93	61	72	37	28.76	29.87	9.81	6	4	14
11	96	60	73	33	28.75	29.86	9.90	5	4	15
12	99	59	73	29	28.73	29.84	10.00	5	7	20
13	101	58	73	27	28.71	29.82	9.94	7	6	23
14	102	57	73	25	28.68	29.79	10.00	8	7	24
15	104	57	73	24	28.65	29.76	10.00	9	8	25
16	104	56	73	23	28.63	29.73	10.00	9	9	25
17	104	56	73	22	28.61	29.72	10.00	9	7	25
18	103	56	72	24	28.61	29.71	9.87	12	6	25
19	101	55	72	25	28.62	29.72	10.00	11	6	25
20	99	56	72	29	28.63	29.74	9.77	10	4	23
21	97	57	72	30	28.65	29.76	10.00	9	4	23
22	95	58	71	33	28.67	29.78	9.87	10	3	21
23	93	60	72	37	28.68	29.79	9.73	9	2	20
24	92	60	72	40	28.69	29.80	9.84	10	2	19

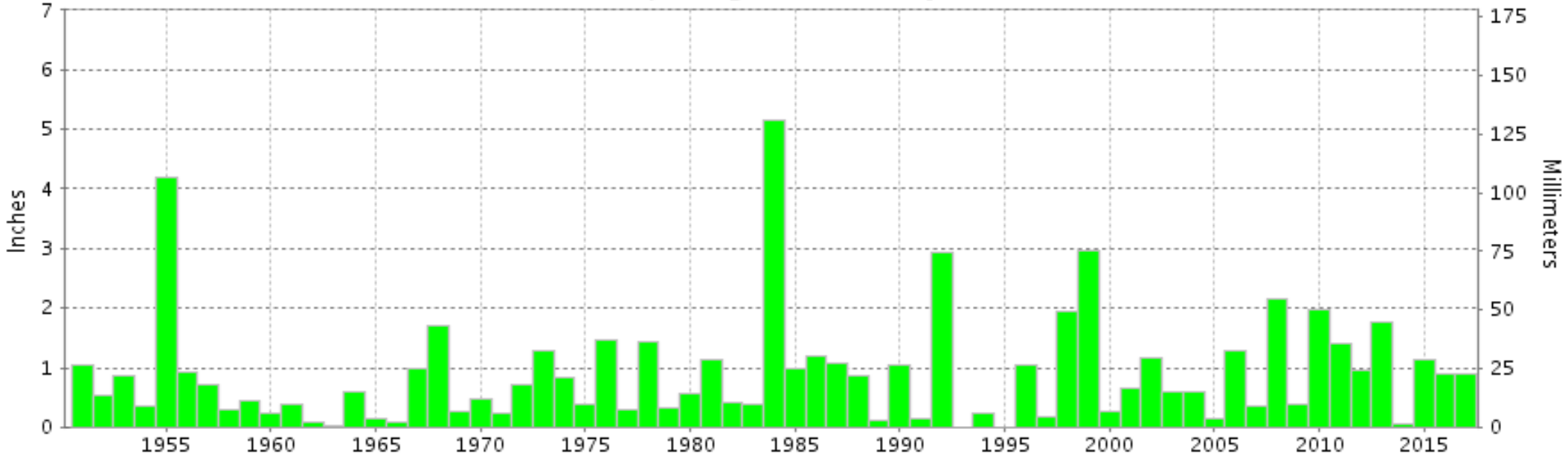
PHOENIX, AZ JULY Temperatures



Long-Term (1951-2017) Mean: 93.8

1981-2010 Normal: 94.8

PHOENIX, AZ JULY Precipitation



Long-Term (1951-2017) Mean Monthly Total: 0.91 **1981-2010 Normal: 1.05**

Published By: National Centers for Environmental Information

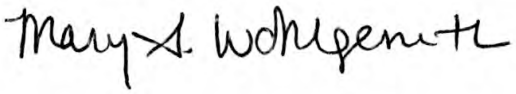
JULY 2017

PHOENIX, AZ

LOCAL CLIMATOLOGICAL DATA

NOAA, National Centers for Environmental Information

I certify that this is an official publication of the National Oceanic and Atmospheric Administration (NOAA). It is compiled using information from weather observing sites operated by NOAA-National Weather Service / Department Of Transportation-Federal Aviation Administration and received at the National Centers for Environmental Information (NCEI), Asheville, North Carolina 28801.



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Attn: User Engagement & Services Branch
151 Patton Avenue
Asheville, NC 28801-5001

JULY 2016
LOCAL CLIMATOLOGICAL DATA
NOAA, National Climatic Data Center

PHOENIX, AZ
PHOENIX SKY HARBOR INTL AIRPORT (KPHX)
Lat:33° 25'N Long: 112° 0'W Elev (Ground) 1107 Feet
Time Zone : MOUNTAIN WBAN: 23183 ISSN#: 0198-0475

Date	Temperature °F						Deg Days BASE 65°		WEATHER	SNOW/ICE ON GND(IN)		PRECIPITATION ON GND(IN)		PRESSURE (INCHES OF HG)		WIND SPEED = MPH DIR = TENS OF DEGREES							Date
										0500 LST	1100 LST	2400 LST	2400 LST						MAXIMUM 3-SEC		MAXIMUM 2-MIN		
	MAXIMUM	MINIMUM	AVERAGE	DEP FROM NORMAL	AVERAGE DEW PT	AVERAGE WET BULB	HEATING	COOLING		DEPTH	WATER-EQUIV	SNOW-FALL	WATER EQUIV	AVERAGE STATION	AVERAGE SEA LEVEL	RESULTANT SPEED	RES DIR	AVERAGE SPEED	SPEED	DIR	SPEED	DIR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	98	78	88*	-4	65	73	0	23	RA				T	28.70	29.82	9.0	12	10.4	24	14	18	12	01
02	104	82	93	1	59	71	0	28					0.00	28.72	29.84	2.6	06	10.0	31	05	24	07	02
03	107	86	97	5	54	70	0	32					0.00	28.72	29.84	3.7	27	6.7	24	29	16	26	03
04	110	87	99	7	50	69	0	34					0.00	28.68	29.80	6.0	27	8.3	24	26	20	27	04
05	111	86	99	7	45	66	0	34					0.00	28.65	29.76	1.4	25	6.5	24	28	18	27	05
06	107	85	96	3	50	68	0	31					0.00	28.67	29.78	4.2	29	8.4	27	27	22	27	06
07	106	85	96	3	53	69	0	31					0.00	28.67	29.79	4.9	28	7.6	23	32	17	26	07
08	109	84	97	4	43	66	0	32					0.00	28.69	29.80	4.5	28	6.4	22	28	17	27	08
09	111	87	99	6	45	67	0	34					0.00	28.69	29.81	6.1	27	7.6	23	27	18	28	09
10	111	87	99	6	42	66	0	34					0.00	28.59	29.70	4.7	24	8.3	30	23	23	26	10
11	110	86	98	5	36	63	0	33					0.00	28.56	29.67	3.4	28	7.2	29	27	22	29	11
12	110	81	96	3	37	63	0	31					0.00	28.61	29.72	1.8	27	7.9	24	29	21	29	12
13	109	85	97	4	45	66	0	32					0.00	28.69	29.81	2.9	28	5.8	19	27	14	26	13
14	111	89	100	7	47	68	0	35					0.00	28.69	29.80	5.0	28	6.7	26	30	20	30	14
15	111	88	100	7	49	69	0	35					0.00	28.63	29.74	5.9	28	7.9	26	29	18	29	15
16	108	90	99	6	51	69	0	34					0.00	28.63	29.74	4.0	29	7.2	22	27	20	28	16
17	105	90	98	5	54	70	0	33	RA				T	28.68	29.79	3.7	20	8.3	30	19	24	19	17
18	106	81	94	1	63	73	0	29	TS TSRA GR RA GS SQ				0.36	28.74	29.87	2.4	15	6.2	63	26	45	26	18
19	107	84	96	3	62	73	0	31	HZ BLDU				0.00	28.74	29.86	3.5	13	6.9	24	17	18	08	19
20	108	85	97	4	60	72	0	32	RA				T	28.72	29.85	1.0	13	6.8	30	35	22	16	20
21	112	88	100	7	57	72	0	35					0.00	28.68	29.80	1.5	11	4.9	19	32	14	27	21
22	112	91	102	9	55	71	0	37	BLDU SQ				0.00	28.67	29.79	3.0	08	8.8	45	01	37	01	22
23	111	90	101	8	56	72	0	36					0.00	28.61	29.72	9.1	27	10.9	25	26	21	27	23
24	107	90	99	6	58	72	0	34					0.00	28.64	29.75	8.2	27	9.9	27	28	23	28	24
25	107	88	98	5	59	72	0	33					0.00	28.66	29.78	4.2	30	8.4	27	30	21	36	25
26	111	91	101	8	57	72	0	36					0.00	28.61	29.72	4.4	27	6.7	26	15	20	16	26
27	112	91	102*	9	60	73	0	37	BLDU				0.00	28.61	29.71	4.1	21	9.8	30	14	23	17	27
28	110	89	100	7	58	72	0	35					0.00	28.61	29.72	2.6	14	7.3	24	15	17	15	28
29	112*	77*	95	2	61	73	0	30	TS TSRA RA				0.53	28.59	29.70	7.1	26	11.9	70*	07	53*	08	29
30	101	80	91	-2	65	73	0	26	RA				T	28.64	29.75	3.2	22	8.5	24	06	21	08	30
31	102	85	94	1	65	73	0	29					0.00	28.66	29.77	8.8	29	11.3	36	36	30	36	31
	108.3	86.0	97.1	¤	53.6	69.9	0.0	32.5	< MONTHLY AVERAGES | TOTALS >				0.89	28.66	29.77	2.7	26	8.0	< MONTHLY AVERAGES				
	2.2	2.5	2.3		<---------- DEPARTURE FROM NORMAL ---------->								-0.16	SUNSHINE, CLOUD, & VISIBILITY TABLES ON PAGE 3									

DEGREE DAYS

	MONTHLY TOTAL	MONTHLY DEPARTURE	SEASON TO DATE TOTAL	SEASON TO DATE DEPARTURE
HEATING :	0	0	0	0
COOLING :	1006	82	2913	329

GREATEST 24-HR PRECIPITATION : 0.53 DATE : 29
GREATEST 24-HR SNOWFALL : DATE :
GREATEST SNOW DEPTH : DATE :

SEA LEVEL PRESSURE		DATE	TIME
MAXIMUM :	29.94	19	0851
MIMIMUM :	29.56	29	1751

NUMBER OF -> DAYS WITH

MAXIMUM TEMP >= 90 :	31	MINIMUM TEMP <= 32 :	0
MAXIMUM TEMP <= 32 :	0	MINIMUM TEMP <= 0 :	0
THUNDERSTORMS :	2	HEAVY FOG :	0

PRECIPITATION >= 0.01 INCH:	2
PRECIPITATION >= 0.10 INCH:	2
SNOWFALL >= 1.0 INCH :	

JULY 2016
PHOENIX, AZ

HOURLY PRECIPITATION
(WATER EQUIVALENT IN INCHES)

PHOENIX, AZ (KPHX)
JULY 2016

WBAN # 23183

Date	FOR HOUR (LST) ENDING AT												Date	FOR HOUR (LST) ENDING AT												Date	Sum of Hourly Data	2400 LST Water Equiv.
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	23	24			
01					T	T							01									T				01	T	T
02													02													02	0.00	0.00
03													03													03	0.00	0.00
04													04													04	0.00	0.00
05													05													05	0.00	0.00
06													06													06	0.00	0.00
07													07													07	0.00	0.00
08													08													08	0.00	0.00
09													09													09	0.00	0.00
10													10													10	0.00	0.00
11													11													11	0.00	0.00
12													12													12	0.00	0.00
13													13													13	0.00	0.00
14													14													14	0.00	0.00
15													15													15	0.00	0.00
16													16													16	0.00	0.00
17													17	T	T											17	T	T
18				0.02									18							0.34	T					18	0.36	0.36
19													19													19	0.00	0.00
20	T	T	T										20													20	T	T
21													21													21	0.00	0.00
22													22													22	0.00	0.00
23													23													23	0.00	0.00
24													24													24	0.00	0.00
25													25													25	0.00	0.00
26													26													26	0.00	0.00
27													27													27	0.00	0.00
28													28													28	0.00	0.00
29													29									0.50	0.03	T	T	29	0.53	0.53
30	T												30													30	T	T
31													31													31	0.00	0.00

*** Indicates sum of Hourly and Daily disagree.**

MAXIMUM SHORT DURATION PRECIPITATION (See Note)

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (Inches)	0.18	0.28	0.31	0.35	0.42	0.50	0.53	0.53	0.53	0.53	0.53	0.53
Ending Date	29	29	29	29	29	29	29	29	29	29	29	29
Ending Time (Hr/Min)	2024	2027	2030	2036	2046	2058	2107	2107	2107	2107	2107	2107

Date and time are not entered for TRACE amounts.

Note : The hourly and daily precipitation totals are printed in the last 2 columns and hi-lighted in red when they disagree. NWS does not edit ASOS hourly values but may edit daily and monthly totals. Hourly, daily, and monthly totals are printed as reported by the ASOS site.

REFERENCE NOTES & SUPPLEMENTAL SUMMARIES

*** = Extreme for the month (last occurence if more than one).**

T = Trace precipitation amount.

+ = also occurs on earlier date.

FG+ = Heavy fog, visibility .25 miles or less.

BLANK entries denote missing or unreported data.

Resultant wind is the vector sum of the wind speeds and directions divided by the number of observations.

Wind direction is recorded in tens of degrees (2 digits) clockwise from true north. '00' = calm, 'VR' = variable.

Precipitation is for the 24-hour period ending at the time indicated in the column heading.

Ceilometer (30-second) data are used to derive cloudiness at or below 12,000 feet. This cloudiness is the mean cloud cover detected during sunrise to sunset (SR-SS), or midnight to midnight (MN-MN).

WEATHER NOTATIONS

QUALIFIER	WEATHER PHENOMENA		
DESCRIPTOR	PRECIPITATION	OBSCURATION	OTHER
BC Patches	DZ Drizzle	BR Mist	DS Duststorm
BL Blowing	GR Hail	DU Widespread Dust	FC Funnel Cloud
DR Low Drifting	GS Small Hail and/or Snow Pellets	FG Fog	+FC Tornado Waterspout
FZ Freezing	IC Ice Crystals	FU Smoke	PO Well-Developed Dust/Sand Whirls
MI Shallow	PL Ice Pellets	HZ Haze	
PR Partial	RA Rain		
SH Shower(s)	SG Snow Grains	PY Spray	SQ Squalls
TS Thunderstorm	SN Snow	SA Sand	SS Sandstorm
VC In the Vicinity	UP Unkown Precipitation	VA Volcanic Ash	GL Glaze

Intensity (as indicated on pages 4 to 6):
'+' = Heavy ' ' = Moderate '-' = Light

PHOENIX, AZ
JULY 2016

Sky Condition is based on the sum (not to exceed 8) of the sunrise to sunset cloud cover below and above 12,000 feet.

Clear = 0-2 oktas, Partly Cloudy = 3-6 oktas, Cloudy = 7-8 oktas.

A Heating (Cooling) Degree Day is the difference between the average daily temperature and 65 degrees F. The HDD season begins July 1, the CDD season begins January 1.

Snow Depth, Snowfall, and Sunshine data may come from nearby sites that the National Weather Service deems Climatologically representative of this site.

NORMALS ARE FOR THE YEARS 1981-2010

ADDITIONAL NOTES & ERRATA:

```
Station Augmentation-CONTRACTOR
  Lat/Lon:33.44417/-112.02472 Elevation:1107FT
  Distance:.5 MI Dir:N
  Augmented Elements:Temp, Precip
  Equipment:MXMN, SRG
```

Date	VISIBILITY (MILES) MINIMUM	MAXIMUM
01	10.00	10.00
02	10.00	10.00
03	10.00	10.00
04	10.00	10.00
05	10.00	10.00
06	10.00	10.00
07	10.00	10.00
08	10.00	10.00
09	10.00	10.00
10	10.00	10.00
11	10.00	10.00
12	10.00	10.00
13	10.00	10.00
14	10.00	10.00
15	10.00	10.00
16	10.00	10.00
17	10.00	10.00
18	8.00	10.00
19	4.00	10.00
20	10.00	10.00
21	10.00	10.00
22	3.00	10.00
23	9.00	10.00
24	10.00	10.00
25	10.00	10.00
26	9.00	10.00
27	9.00	10.00
28	10.00	10.00
29	2.00	10.00
30	10.00	10.00
31	10.00	10.00
AVGS	9.16	10.00

MINIMUM VISIBILTY (MILES)

<= .25	<= 3.0	>= 7.0
0	2	28

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2016 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0522 JUL 01 SUNSET: 1942								
02	OVC	100	10.00		83	65	71	55	9	15	28.69	29.81
05	OVC	120	10.00	-RA	82	68	73	63	9	10	28.69	29.81
08	SCT	160	10.00		80	67	71	64	8	07	28.76	29.88
11	SCT	180	10.00		85	66	72	53	11	16	28.77	29.89
14	SCT	180	10.00		93	66	74	41	13	18	28.70	29.82
17	SCT	180	10.00		95	64	74	36	14	14	28.65	29.75
20	BKN	160	10.00		92	63	73	38	9	12	28.66	29.78
23	OVC	240	10.00		89	64	72	43	7	13	28.72	29.84
				SUNRISE: 0522 JUL 02 SUNSET: 1942								
02	BKN	250	10.00		85	61	69	45	11	09	28.70	29.82
05	BKN	250	10.00		82	63	70	53	13	07	28.74	29.86
08	SCT	200	10.00		86	62	70	45	24	07	28.81	29.93
11	FEW	200	10.00		94	63	73	36	9	11	28.80	29.91
14	SCT	140	10.00		100	60	73	27	3	VR	28.74	29.86
17	SCT	095	10.00		103	56	72	21	9	30	28.69	29.79
20	FEW	150	10.00		101	52	70	19	9	28	28.68	29.79
23	CLR	NC	10.00		95	56	70	27	15	25	28.70	29.81
				SUNRISE: 0523 JUL 03 SUNSET: 1942								
02	CLR	NC	10.00		92	55	69	29	10	33	28.73	29.84
05	CLR	NC	10.00		87	55	67	34	6	25	28.76	29.87
08	CLR	NC	10.00		91	57	69	32	7	11	28.80	29.91
11	FEW	090	10.00		98	56	71	24	6	VR	28.80	29.92
14	SCT	250	10.00		104	55	72	20	5	20	28.73	29.85
17	FEW	100	10.00		106	53	72	17	14	27	28.66	29.78
20	FEW	100	10.00		103	51	70	18	11	29	28.66	29.76
23	CLR	NC	10.00		98	51	69	20	6	26	28.69	29.80
				SUNRISE: 0523 JUL 04 SUNSET: 1941								
02	CLR	NC	10.00		94	53	68	25	9	29	28.70	29.80
05	CLR	NC	10.00		90	53	67	28	6	28	28.70	29.82
08	CLR	NC	10.00		92	56	69	30	6	11	28.75	29.86
11	FEW	100	10.00		100	54	70	21	7	VR	28.75	29.86
14	FEW	120	10.00		107	51	71	15	9	24	28.70	29.80
17	FEW	120	10.00		108	47	70	13	14	31	28.63	29.72
20	FEW	120	10.00		104	44	68	13	11	26	28.63	29.73
23	CLR	NC	10.00		99	44	66	15	9	26	28.66	29.76
				SUNRISE: 0524 JUL 05 SUNSET: 1941								
02	CLR	NC	10.00		95	43	65	17	5	32	28.66	29.76
05	SCT	150	10.00		87	49	64	27	6	11	28.69	29.79
08	FEW	250	10.00		91	49	66	24	6	10	28.72	29.83
11	SCT	250	10.00		99	48	68	18	0	00	28.72	29.83
14	FEW	250	10.00		106	46	69	13	7	15	28.66	29.77
17	FEW	250	10.00		108	40	68	10	8	26	28.60	29.70
20	FEW	250	10.00		105	40	67	11	14	27	28.58	29.68
23	CLR	NC	10.00		96	40	64	14	3	21	28.63	29.74
				SUNRISE: 0524 JUL 06 SUNSET: 1941								
02	CLR	NC	10.00		93	43	64	18	5	03	28.66	29.77
05	CLR	NC	10.00		85	43	61	23	8	11	28.72	29.83
08	FEW	180	10.00		91	52	67	26	5	20	28.76	29.87
11	FEW	220	10.00		96	55	70	25	3	VR	28.74	29.85
14	FEW	250	10.00		104	50	70	16	6	30	28.69	29.79
17	FEW	250	10.00		105	53	71	18	5	VR	28.60	29.70
20	FEW	100	10.00		101	53	70	20	20	26	28.60	29.70
23	CLR	NC	10.00		95	56	70	27	16	29	28.66	29.76

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0525 JUL 07 SUNSET: 1941								
02	CLR	NC	10.00		91	50	66	25	13	28	28.68	29.78
05	CLR	NC	10.00		86	55	67	35	7	29	28.71	29.82
08	FEW	120	10.00		88	58	69	36	0	00	28.75	29.86
11	FEW	085	10.00		99	57	72	25	5	VR	28.74	29.85
14	FEW	100	10.00		103	56	72	21	7	VR	28.69	29.79
17	FEW	100	10.00		104	55	72	20	7	VR	28.62	29.72
20	FEW	100	10.00		104	50	70	16	16	28	28.61	29.71
23	CLR	NC	10.00		96	43	65	16	7	25	28.66	29.77
				SUNRISE: 0525 JUL 08 SUNSET: 1941								
02	CLR	NC	10.00		93	42	64	17	7	28	28.69	29.79
05	CLR	NC	10.00		87	40	61	19	5	25	28.71	29.83
08	CLR	NC	10.00		91	40	62	17	3	10	28.76	29.88
11	FEW	250	10.00		100	40	65	13	3	15	28.76	29.88
14	FEW	250	10.00		105	42	67	12	6	VR	28.70	29.81
17	FEW	150	10.00		107	42	68	11	10	27	28.64	29.74
20	CLR	NC	10.00		104	47	69	15	11	31	28.63	29.73
23	CLR	NC	10.00		96	50	68	21	7	24	28.68	29.79
				SUNRISE: 0526 JUL 09 SUNSET: 1941								
02	CLR	NC	10.00		95	47	66	19	8	30	28.69	29.79
05	CLR	NC	10.00		91	47	65	22	5	28	28.72	29.83
08	CLR	NC	10.00		93	45	65	19	0	00	28.78	29.89
11	FEW	200	10.00		101	43	67	14	0	00	28.78	29.89
14	FEW	200	10.00		107	42	68	11	10	27	28.71	29.82
17	FEW	200	10.00		110	43	69	10	11	27	28.65	29.75
20	FEW	250	10.00		106	46	69	13	15	27	28.63	29.72
23	CLR	NC	10.00		98	48	67	18	6	25	28.65	29.75
				SUNRISE: 0526 JUL 10 SUNSET: 1940								
02	CLR	NC	10.00		96	48	67	19	8	26	28.64	29.75
05	CLR	NC	10.00		88	52	66	29	6	10	28.66	29.76
08	FEW	250	10.00		93	52	68	25	7	12	28.69	29.79
11	FEW	250	10.00		101	45	67	15	3	VR	28.66	29.77
14	FEW	250	10.00		108	43	69	11	10	26	28.59	29.69
17	CLR	NC	10.00		109	35	67	8	13	26	28.52	29.62
20	CLR	NC	10.00		103	28	63	7	8	23	28.50	29.60
23	CLR	NC	10.00		98	33	62	10	8	24	28.52	29.62
				SUNRISE: 0527 JUL 11 SUNSET: 1940								
02	CLR	NC	10.00		94	38	63	14	10	25	28.54	29.64
05	CLR	NC	10.00		92	36	61	14	6	27	28.58	29.67
08	CLR	NC	10.00		90	46	64	22	7	14	28.63	29.73
11	CLR	NC	10.00		99	40	65	13	0	00	28.62	29.72
14	CLR	NC	10.00		105	37	66	10	7	27	28.56	29.66
17	CLR	NC	10.00		107	39	67	10	17	27	28.52	29.62
20	CLR	NC	10.00		103	29	63	7	14	30	28.52	29.62
23	CLR	NC	10.00		93	24	59	8	0	00	28.57	29.67
				SUNRISE: 0527 JUL 12 SUNSET: 1940								
02	CLR	NC	10.00		88	27	57	11	0	00	28.58	29.69
05	CLR	NC	10.00		84	37	59	19	10	08	28.62	29.72
08	CLR	NC	10.00		88	46	63	23	7	09	28.68	29.78
11	CLR	NC	10.00		99	41	65	14	8	09	28.68	29.78
14	CLR	NC	10.00		107	40	67	10	13	17	28.62	29.73
17	CLR	NC	10.00		108	37	67	9	9	33	28.56	29.67
20	CLR	NC	10.00		103	37	65	10	15	26	28.57	29.67
23	CLR	NC	10.00		97	37	63	12	10	26	28.64	29.74

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2016 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0528 JUL 13 SUNSET: 1940								
02	CLR	NC	10.00		92	41	63	17	7	02	28.66	29.76
05	CLR	NC	10.00		85	45	62	25	5	20	28.71	29.82
08	CLR	NC	10.00		91	48	65	23	0	00	28.78	29.89
11	CLR	NC	10.00		98	42	65	15	0	00	28.78	29.89
14	FEW	120	10.00		105	40	67	11	5	VR	28.72	29.83
17	FEW	120	10.00		107	43	68	11	6	29	28.65	29.75
20	FEW	120	10.00		105	50	70	16	10	31	28.64	29.74
23	CLR	NC	10.00		98	53	69	22	6	23	28.68	29.78
				SUNRISE: 0528 JUL 14 SUNSET: 1939								
02	CLR	NC	10.00		95	51	68	23	9	28	28.69	29.80
05	CLR	NC	10.00		92	47	65	21	6	34	28.72	29.83
08	CLR	NC	10.00		93	48	66	21	7	32	28.79	29.90
11	CLR	NC	10.00		100	47	68	16	9	35	28.78	29.89
14	FEW	220	10.00		107	48	70	14	8	21	28.70	29.81
17	FEW	220	10.00		110	40	68	9	11	26	28.64	29.73
20	FEW	220	10.00		107	42	68	11	9	26	28.61	29.71
23	CLR	NC	10.00		100	46	67	16	7	26	28.62	29.72
				SUNRISE: 0529 JUL 15 SUNSET: 1939								
02	CLR	NC	10.00		94	50	67	22	3	24	28.64	29.74
05	CLR	NC	10.00		91	52	67	26	7	09	28.66	29.77
08	CLR	NC	10.00		94	50	67	22	9	33	28.72	29.83
11	CLR	NC	10.00		101	49	69	17	6	VR	28.72	29.83
14	FEW	120	10.00		108	47	70	13	9	28	28.65	29.75
17	FEW	120	10.00		110	46	70	12	8	27	28.57	29.66
20	CLR	NC	10.00		108	46	70	12	13	28	28.54	29.64
23	CLR	NC	10.00		100	51	69	19	10	25	28.58	29.68
				SUNRISE: 0530 JUL 16 SUNSET: 1938								
02	CLR	NC	10.00		96	49	67	20	11	29	28.60	29.70
05	CLR	NC	10.00		92	51	67	25	9	02	28.69	29.79
08	SCT	250	10.00		92	54	68	28	6	33	28.74	29.85
11	FEW	250	10.00		98	53	69	22	3	VR	28.71	29.82
14	FEW	250	10.00		105	51	71	16	3	21	28.64	29.74
17	CLR	NC	10.00		107	51	71	15	5	VR	28.56	29.66
20	FEW	250	10.00		104	52	71	18	8	25	28.55	29.65
23	SCT	180	10.00		101	51	69	19	11	25	28.60	29.70
				SUNRISE: 0530 JUL 17 SUNSET: 1938								
02	CLR	NC	10.00		96	50	68	21	8	10	28.63	29.73
05	BKN	230	10.00		91	56	69	31	7	08	28.65	29.75
08	BKN	250	10.00		94	56	70	28	5	15	28.70	29.81
11	BKN	250	10.00		102	53	71	19	9	22	28.73	29.84
14	BKN	250	10.00		97	54	70	24	17	22	28.72	29.83
17	SCT	120	10.00		103	52	70	18	7	21	28.65	29.75
20	BKN	160	10.00		99	54	70	22	10	26	28.68	29.78
23	SCT	160	10.00		96	55	70	25	0	00	28.70	29.81
				SUNRISE: 0531 JUL 18 SUNSET: 1937								
02	BKN	250	10.00		95	55	69	26	5	34	28.72	29.84
05	BKN	150	10.00		85	68	73	57	7	01	28.79	29.90
08	SCT	160	10.00		90	63	72	41	5	10	28.82	29.93
11	SCT	180	10.00		95	61	72	32	0	00	28.82	29.93
14	SCT	240	10.00		101	60	73	26	5	25	28.75	29.86
17	SCT	250	10.00		105	59	74	22	10	30	28.66	29.77
20	BKN	130	10.00		85	69	74	59	7	21	28.71	29.83
23	SCT	200	10.00		89	66	73	47	8	16	28.77	29.89

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0532 JUL 19 SUNSET: 1937								
02	SCT	200	10.00		88	65	73	46	7	13	28.76	29.87
05	BKN	200	10.00		85	65	72	51	5	11	28.78	29.89
08	BKN	190	10.00		89	66	73	47	7	12	28.82	29.94
11	SCT	250	10.00		96	62	73	32	5	VR	28.80	29.92
14	SCT	250	10.00		103	59	73	24	6	VR	28.72	29.83
17	BKN	250	10.00		107	56	73	19	10	26	28.66	29.77
20	BKN	250	10.00		99	60	73	28	13	12	28.69	29.80
23	BKN	250	10.00		92	61	72	36	9	11	28.75	29.87
				SUNRISE: 0532 JUL 20 SUNSET: 1937								
02	OVC	160	10.00	-RA	87	66	73	50	8	13	28.79	29.91
05	BKN	160	10.00		86	67	73	53	9	15	28.76	29.87
08	BKN	190	10.00		89	64	72	43	6	14	28.79	29.91
11	SCT	170	10.00		97	59	72	28	6	14	28.79	29.91
14	SCT	250	10.00		105	57	73	20	8	23	28.71	29.82
17	SCT	250	10.00		106	54	72	18	6	29	28.66	29.77
20	SCT	210	10.00		101	57	72	23	7	33	28.66	29.78
23	BKN	250	10.00		97	57	71	26	3	08	28.70	29.82
				SUNRISE: 0533 JUL 21 SUNSET: 1936								
02	BKN	230	10.00		91	61	71	37	6	12	28.69	29.80
05	BKN	250	10.00		89	60	70	38	5	10	28.71	29.82
08	FEW	250	10.00		94	60	72	32	9	11	28.75	29.86
11	SCT	250	10.00		102	57	72	23	0	00	28.75	29.86
14	SCT	250	10.00		108	56	73	18	5	VR	28.69	29.80
17	SCT	250	10.00		110	54	73	16	5	28	28.63	29.73
20	BKN	250	10.00		107	53	72	17	5	29	28.64	29.74
23	BKN	250	10.00		102	59	73	24	0	00	28.66	29.77
				SUNRISE: 0534 JUL 22 SUNSET: 1935								
02	BKN	250	10.00		96	60	72	30	9	11	28.69	29.79
05	BKN	250	3.00	BLDU	94	57	70	29	21	15	28.74	29.85
08	BKN	250	10.00		95	57	70	28	9	10	28.77	29.88
11	BKN	230	10.00		101	56	72	22	3	VR	28.76	29.87
14	SCT	250	10.00		110	55	74	16	6	VR	28.69	29.78
17	BKN	250	10.00		111	52	73	14	7	25	28.60	29.70
20	BKN	250	10.00		105	53	71	18	15	02	28.62	29.72
23	SCT	250	10.00		98	53	69	22	5	11	28.63	29.73
				SUNRISE: 0534 JUL 23 SUNSET: 1935								
02	BKN	250	10.00		96	53	69	23	3	27	28.63	29.73
05	BKN	250	10.00		92	56	69	30	5	08	28.64	29.73
08	BKN	250	10.00		95	56	70	27	11	32	28.70	29.81
11	BKN	250	10.00		103	58	73	23	13	27	28.69	29.80
14	SCT	250	10.00		107	57	74	19	13	27	28.63	29.73
17	FEW	250	10.00		111	53	73	15	14	27	28.54	29.64
20	FEW	250	10.00		107	53	72	17	13	26	28.53	29.63
23	FEW	250	10.00		100	60	73	27	16	26	28.58	29.68
				SUNRISE: 0535 JUL 24 SUNSET: 1934								
02	FEW	200	10.00		96	57	71	27	11	26	28.58	29.68
05	FEW	250	10.00		93	57	70	30	7	29	28.63	29.72
08	SCT	250	10.00		92	58	70	32	6	VR	28.75	29.86
11	BKN	250	10.00		98	59	72	27	9	29	28.74	29.85
14	BKN	250	10.00		102	58	73	23	9	25	28.68	29.78
17	BKN	250	10.00		106	57	73	20	11	27	28.59	29.69
20	SCT	250	10.00		103	56	72	21	9	25	28.60	29.70
23	FEW	250	10.00		98	61	73	29	13	26	28.63	29.73

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2016 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0536		**JUL 25**			**SUNSET: 1934**						
02	FEW	250	10.00		92	63	73	38	10	30	28.68	29.78
05	SCT	130	10.00		89	62	71	41	5	12	28.69	29.80
08	SCT	250	10.00		91	62	72	38	9	29	28.77	29.88
11	SCT	250	10.00		98	57	71	25	11	28	28.75	29.87
14	SCT	250	10.00		104	57	73	21	13	27	28.66	29.77
17	SCT	250	10.00		106	56	73	19	8	31	28.60	29.70
20	SCT	160	10.00		100	57	72	24	13	34	28.62	29.72
23	SCT	250	10.00		97	54	70	24	0	00	28.64	29.74
	SUNRISE: 0536		**JUL 26**			**SUNSET: 1933**						
02	BKN	190	10.00		94	55	69	27	11	32	28.63	29.73
05	BKN	180	10.00		91	57	69	32	7	24	28.65	29.75
08	FEW	170	10.00		95	57	70	28	5	30	28.69	29.80
11	SCT	250	10.00		102	56	72	22	0	00	28.69	29.79
14	SCT	250	9.00		108	56	73	18	8	21	28.61	29.71
17	SCT	250	10.00		109	56	74	17	9	32	28.54	29.64
20	SCT	250	10.00		107	57	74	19	14	27	28.54	29.64
23	FEW	250	10.00		102	58	73	23	9	25	28.58	29.68
	SUNRISE: 0537		**JUL 27**			**SUNSET: 1932**						
02	FEW	250	10.00		93	65	74	40	15	15	28.61	29.71
05	FEW	230	10.00		92	62	72	37	6	07	28.65	29.75
08	SCT	250	10.00		96	62	73	32	5	15	28.69	29.80
11	SCT	250	10.00		103	61	74	25	7	16	28.70	29.80
14	SCT	250	10.00		109	58	75	19	10	25	28.62	29.71
17	SCT	250	10.00		112	56	74	16	13	25	28.52	29.62
20	BKN	250	10.00		109	55	73	17	13	26	28.52	29.61
23	SCT	250	10.00		102	58	73	23	7	16	28.59	29.68
	SUNRISE: 0538		**JUL 28**			**SUNSET: 1932**						
02	BKN	200	10.00		93	60	71	33	9	12	28.62	29.72
05	SCT	200	10.00		91	61	71	37	17	15	28.69	29.79
08	BKN	250	10.00		90	61	71	38	8	14	28.71	29.82
11	FEW	180	10.00		101	59	73	25	5	18	28.69	29.80
14	SCT	250	10.00		108	58	74	19	7	36	28.61	29.71
17	SCT	250	10.00		110	56	74	17	7	26	28.54	29.64
20	SCT	250	10.00		108	55	73	17	7	30	28.53	29.63
23	FEW	250	10.00		101	57	72	23	11	07	28.57	29.67
	SUNRISE: 0538		**JUL 29**			**SUNSET: 1931**						
02	BKN	230	10.00		100	62	74	29	8	28	28.57	29.66
05	BKN	210	10.00		95	63	73	35	7	25	28.61	29.71
08	FEW	160	10.00		94	62	73	35	13	29	28.66	29.76
11	FEW	250	10.00		99	62	74	30	3	VR	28.65	29.75
14	SCT	250	10.00		108	61	76	22	13	25	28.57	29.66
17	SCT	250	10.00		111	53	73	15	16	27	28.47	29.57
20	BKN	250	10.00	TS	108	55	73	17		35	28.53	29.63
23	OVC	250	10.00	-RA	83	64	70	53	22	17	28.69	29.80
	SUNRISE: 0539		**JUL 30**			**SUNSET: 1930**						
02	BKN	110	10.00		81	68	72	65	14	08	28.61	29.71
05	BKN	250	10.00		84	66	72	55	7	25	28.68	29.79
08	BKN	250	10.00		87	66	73	50	6	09	28.69	29.81
11	SCT	200	10.00		92	67	75	44	7	14	28.69	29.81
14	SCT	200	10.00		97	64	74	34	3	08	28.65	29.76
17	SCT	250	10.00		100	63	75	30	10	25	28.58	29.68
20	SCT	250	10.00		96	63	74	34	10	23	28.58	29.69
23	SCT	250	10.00		93	66	74	41	10	27	28.65	29.75

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0540		**JUL 31**			**SUNSET: 1929**						
02	BKN	250	10.00		89	66	73	47	13	28	28.65	29.75
05	BKN	250	10.00		87	66	73	50	10	31	28.68	29.79
08	BKN	180	10.00		87	66	73	50	9	27	28.71	29.83
11	BKN	190	10.00		91	65	73	42	8	28	28.73	29.84
14	SCT	250	10.00		98	65	75	34	9	22	28.66	29.77
17	SCT	250	10.00		101	62	74	28	6	VR	28.58	29.68
20	BKN	230	10.00		97	62	73	32	6	02	28.61	29.71
23	BKN	230	10.00		88	62	71	42	10	29	28.70	29.81

3-HOURLY OBSERVATION NOTES

Sky Cover is the amount of the sky obscured. CLR or SKC = 0, FEW = 1/8-2/8, SCT = 3/8-4/8, BKN = 5/8-7/8, OVC = 8/8, W = Vertical Visibility = 8/8

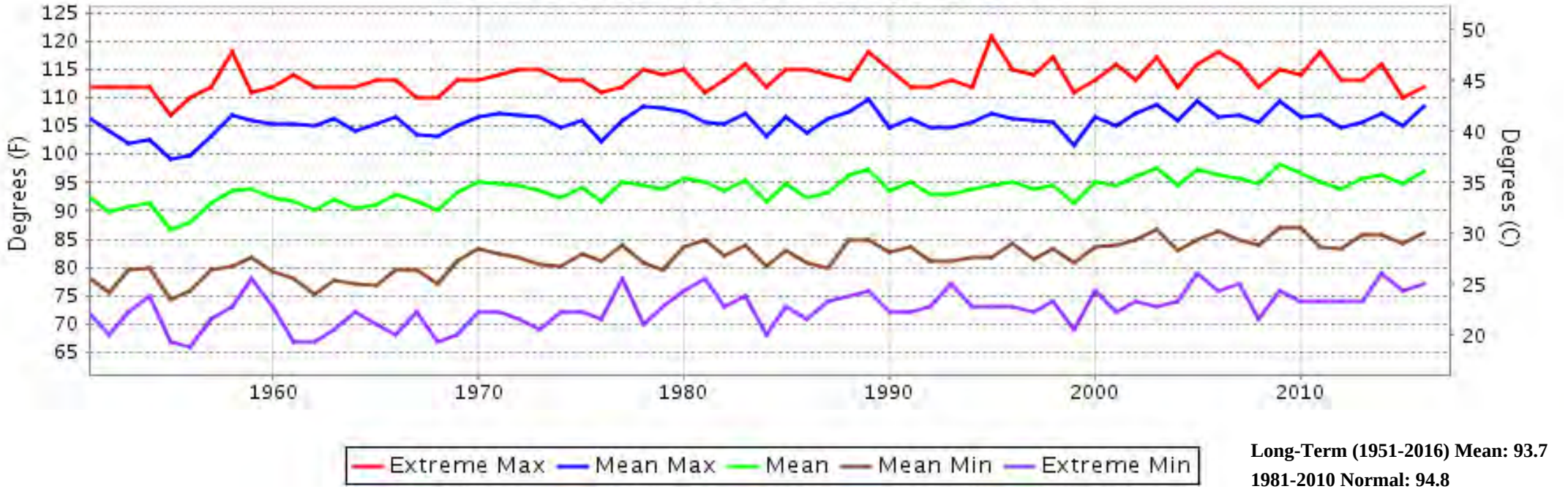
Ceiling is reported in hundreds of feet above ground level for clouds at or below 12,000 feet. NC = No Ceiling detected.

& = Original observation containted additional weather elements.
See page 3 for additional notes.

SUMMARY BY HOUR

HOUR (LST)	AVERAGES DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY	PRESSURE (Inches, HG) STATION	SEA LEVEL	VISIBILITY (Miles)	WIND SPEED (MPH)	RESULTANT WIND (MPH) SPEED	DIRECTION
01	94	53	69	28	28.66	29.76	10.00	8	4	25
02	92	54	69	30	28.66	29.76	10.00	8	2	24
03	91	55	68	31	28.66	29.77	10.00	7	1	15
04	90	55	68	33	28.68	29.78	10.00	6	2	15
05	89	55	68	34	28.69	29.80	9.77	8	2	13
06	88	56	68	36	28.71	29.82	9.97	6	3	11
07	89	56	68	35	28.73	29.84	9.97	6	4	11
08	91	56	69	32	28.74	29.85	10.00	7	3	12
09	93	56	70	30	28.75	29.86	10.00	7	3	12
10	96	56	70	27	28.74	29.85	10.00	6	2	18
11	98	55	70	25	28.74	29.85	10.00	5	3	20
12	101	54	71	22	28.72	29.83	10.00	6	3	23
13	103	54	71	21	28.70	29.81	10.00	7	4	24
14	104	53	72	19	28.67	29.78	9.97	8	6	25
15	106	52	72	18	28.64	29.75	10.00	9	7	26
16	107	52	72	17	28.62	29.72	10.00	9	9	26
17	107	51	71	17	28.60	29.70	10.00	10	8	26
18	106	51	71	17	28.59	29.69	9.94	11	9	26
19	105	50	71	17	28.59	29.69	9.97	12	8	26
20	103	51	70	20	28.60	29.70	10.00	11	8	26
21	100	52	70	23	28.62	29.72	9.55	10	5	26
22	98	52	69	23	28.64	29.74	10.00	9	4	25
23	96	53	69	25	28.65	29.75	10.00	8	5	25
24	95	53	69	26	28.65	29.76	9.97	8	5	25

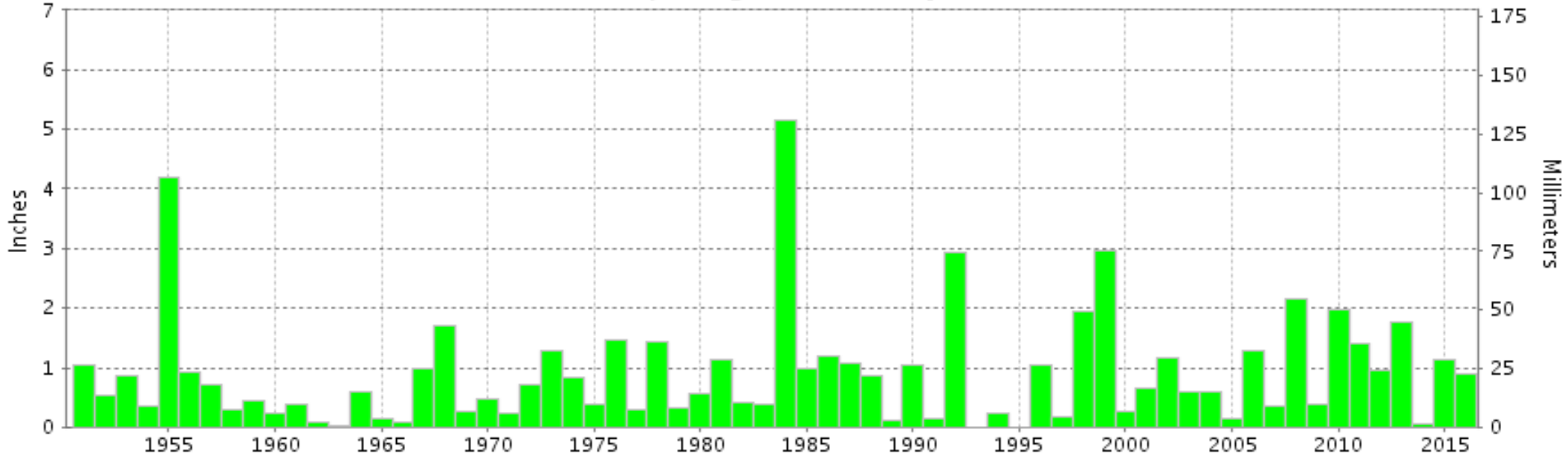
PHOENIX, AZ JULY Temperatures



Long-Term (1951-2016) Mean: 93.7

1981-2010 Normal: 94.8

PHOENIX, AZ JULY Precipitation



Long-Term (1951-2016) Mean Monthly Total: 0.91 **1981-2010 Normal: 1.05**

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JULY 2016
PHOENIX, AZ

LOCAL CLIMATOLOGICAL DATA

NOAA, National Climatic Data Center

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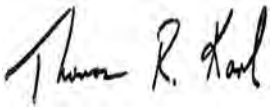

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151 Patton Avenue
Asheville, NC 28801-5001

JULY 2015
LOCAL CLIMATOLOGICAL DATA
NOAA, National Centers for Environmental Information

PHOENIX, AZ
PHOENIX SKY HARBOR INTL AIRPORT (KPHX)
Lat:33° 25'N Long: 112° 0'W Elev (Ground) 1107 Feet
Time Zone : MOUNTAIN WBAN: 23183 ISSN#: 0198-0475

Date	Temperature °F						Deg Days BASE 65°		WEATHER	SNOW/ICE ON GND(IN)		PRECIPITATION ON GND(IN)		PRESSURE (INCHES OF HG)		WIND SPEED = MPH DIR = TENS OF DEGREES							Date
										0500 LST	1100 LST	2400 LST	2400 LST						MAXIMUM 3-SEC		MAXIMUM 2-MIN		
	MAXIMUM	MINIMUM	AVERAGE	DEP FROM NORMAL	AVERAGE DEW PT	AVERAGE WET BULB	HEATING	COOLING		DEPTH	WATER-EQUIV	SNOW-FALL	WATER EQUIV	AVERAGE STATION	AVERAGE SEA LEVEL	RESULTANT SPEED	RES DIR	AVERAGE SPEED	SPEED	DIR	SPEED	DIR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	106	84	95	3	61	72	0	30					0.00	28.67	29.79	7.3	25	11.3	30	28	24	27	01
02	106	88	97	5	56	70	0	32					0.00	28.64	29.76	9.5	25	10.1	28	27	18	28	02
03	100	82	91	-1	61	72	0	26	TS TSRA RA				0.08	28.62	29.74	0.7	15	7.3	27	12	22	01	03
04	106	85	96	4	59	72	0	31					0.00	28.59	29.71	6.3	26	8.9	29	29	22	28	04
05	102	84	93	1	60	71	0	28					0.00	28.70	29.80	3.9	21	10.6	40	16	28	17	05
06	104	78	91	-2	61	72	0	26	TS TSRA RA				T	28.71	29.83	3.8	25	7.1	26	26	22	26	06
07	108	85	97	4	54	70	0	32					0.00	28.61	29.73	2.8	28	7.0	23	28	18	28	07
08	109	87	98	5	43	65	0	33					0.00	28.54	29.66	5.4	23	10.8	27	24	22	24	08
09	102	83	93	0	38	62	0	28					0.00	28.59	29.70	6.2	20	10.6	33	15	25	21	09
10	104	78	91	-2	48	65	0	26					0.00	28.64	29.75	6.6	22	11.9	32	18	24	29	10
11	106	85	96	3	49	67	0	31					0.00	28.69	29.81	5.7	27	8.7	30	17	24	17	11
12	106	84	95	2	40	64	0	30					0.00	28.72	29.84	2.8	28	5.8	22	29	16	28	12
13	108	88	98	5	55	70	0	33	RA				T	28.64	29.76	0.9	21	8.5	26	14	21	14	13
14	109	88	99	6	55	70	0	34					0.00	28.59	29.71	4.8	14	8.0	27	33	20	12	14
15	106	87	97	4	56	70	0	32					0.00	28.64	29.75	3.3	19	8.5	27	14	20	18	15
16	107	87	97	4	52	69	0	32					0.00	28.64	29.76	3.2	21	7.2	27	19	21	19	16
17	104	80	92	-1	60	71	0	27	TS RA				0.15	28.66	29.77	6.9	16	9.1	33	30	28	31	17
18	100	76*	88	-5	65	72	0	23	TS TSRA RA BR				0.18	28.76	29.87	1.8	20	7.8	29	29	24	30	18
19	97	77	87*	-6	65	72	0	22					0.00	28.81	29.94	3.1	25	6.5	19	27	17	27	19
20	102	84	93	0	61	72	0	28					0.00	28.72	29.85	4.8	26	6.3	25	28	16	27	20
21	106	85	96	3	57	71	0	31					0.00	28.61	29.72	5.5	26	6.7	24	31	18	27	21
22	107	86	97	4	45	66	0	32					0.00	28.61	29.73	3.4	27	6.6	24	26	21	27	22
23	105	84	95	2	47	66	0	30					0.00	28.72	29.83	1.6	14	4.8	26	16	20	17	23
24	104	87	96	3	58	71	0	31					0.00	28.75	29.87	3.4	26	7.1	22	28	16	27	24
25	109	88	99*	6	38	64	0	34					0.00	28.66	29.78	6.1	28	7.8	24	27	20	28	25
26	108	86	97	4	38	64	0	32					0.00	28.59	29.71	5.4	26	8.6	25	29	18	26	26
27	106	86	96	3	53	69	0	31					0.00	28.61	29.72	5.6	28	8.1	25	29	20	28	27
28	106	88	97	4	57	70	0	32	BLDU				0.00	28.65	29.75	3.7	24	8.3	46*	18	31*	17	28
29	100	87	94	1	61	72	0	29					0.00	28.74	29.87	2.1	10	9.1	33	08	28	07	29
30	106	85	96	3	59	72	0	31					0.00	28.74	29.87	2.0	07	7.0	19	30	17	31	30
31	110*	78	94	1			0	29					0.72					8.5	36	05	29	05	31
	105.1	84.2	94.7	¤	53.7	69.1	0.0	29.9	< MONTHLY AVERAGES | TOTALS >				1.13	28.66	29.78	3.2	24	8.2	< MONTHLY AVERAGES				
	-1.0	0.7	-0.1		<---------- DEPARTURE FROM NORMAL ---------->								0.08	SUNSHINE, CLOUD, & VISIBILITY TABLES ON PAGE 3									

DEGREE DAYS

	MONTHLY TOTAL	MONTHLY DEPARTURE	SEASON TO DATE TOTAL	SEASON TO DATE DEPARTURE
HEATING :	0	0	0	0
COOLING :	926	2	2827	243

GREATEST 24-HR PRECIPITATION : 0.72 DATE : 31
GREATEST 24-HR SNOWFALL : DATE :
GREATEST SNOW DEPTH : DATE :

SEA LEVEL PRESSURE	DATE	TIME
MAXIMUM : 30.00	19	1051
MIMIMUM : 29.55	08	1751

NUMBER OF -> DAYS WITH

MAXIMUM TEMP >= 90 : 31	MINIMUM TEMP <= 32 : 0	PRECIPITATION >= 0.01 INCH: 4
MAXIMUM TEMP <= 32 : 0	MINIMUM TEMP <= 0 : 0	PRECIPITATION >= 0.10 INCH: 3
THUNDERSTORMS : 4	HEAVY FOG : 0	SNOWFALL >= 1.0 INCH :

JULY 2015
PHOENIX, AZ

HOURLY PRECIPITATION
(WATER EQUIVALENT IN INCHES)

PHOENIX, AZ (KPHX)
JULY 2015

WBAN # 23183

Date	FOR HOUR (LST) ENDING AT												Date	FOR HOUR (LST) ENDING AT												Date	Sum of Hourly Data	2400 LST Water Equiv.
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	23	24			
01													01													01	0.00	0.00
02													02													02	0.00	0.00
03		T	T	T	T	0.08	T						03		T	T										03	0.08	0.08
04													04													04	0.00	0.00
05													05													05	0.00	0.00
06						T	T						06													06	T	T
07													07													07	0.00	0.00
08													08													08	0.00	0.00
09													09													09	0.00	0.00
10													10													10	0.00	0.00
11													11													11	0.00	0.00
12													12													12	0.00	0.00
13									T				13													13	T	T
14													14													14	0.00	0.00
15													15													15	0.00	0.00
16													16													16	0.00	0.00
17													17										0.07	0.08	T	17	0.15	0.15
18													18						T	T	T	T	0.14	0.04	T	18	0.18	0.18
19													19													19	0.00	0.00
20													20													20	0.00	0.00
21													21													21	0.00	0.00
22													22													22	0.00	0.00
23													23													23	0.00	0.00
24													24													24	0.00	0.00
25													25													25	0.00	0.00
26													26													26	0.00	0.00
27													27													27	0.00	0.00
28													28													28	0.00	0.00
29													29													29	0.00	0.00
30													30													30	0.00	0.00
31													31													31	0.00*	0.72

*** Indicates sum of Hourly and Daily disagree.**

MAXIMUM SHORT DURATION PRECIPITATION (See Note)

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (Inches)												
Ending Date												
Ending Time (Hr/Min)												

Date and time are not entered for TRACE amounts.

Note : The hourly and daily precipitation totals are printed in the last 2 columns and hi-lighted in red when they disagree. NWS does not edit ASOS hourly values but may edit daily and monthly totals. Hourly, daily, and monthly totals are printed as reported by the ASOS site.

REFERENCE NOTES & SUPPLEMENTAL SUMMARIES

*** = Extreme for the month (last occurence if more than one).**

T = Trace precipitation amount.

+ = also occurs on earlier date.

FG+ = Heavy fog, visibility .25 miles or less.

BLANK entries denote missing or unreported data.

Resultant wind is the vector sum of the wind speeds and directions divided by the number of observations.

Wind direction is recorded in tens of degrees (2 digits) clockwise from true north. '00' = calm, 'VR' = variable.

Precipitation is for the 24-hour period ending at the time indicated in the column heading.

Ceilometer (30-second) data are used to derive cloudiness at or below 12,000 feet. This cloudiness is the mean cloud cover detected during sunrise to sunset (SR-SS), or midnight to midnight (MN-MN).

WEATHER NOTATIONS

QUALIFIER	WEATHER PHENOMENA		
DESCRIPTOR	PRECIPITATION	OBSCURATION	OTHER
BC Patches	DZ Drizzle	BR Mist	DS Duststorm
BL Blowing	GR Hail	DU Widespread Dust	FC Funnel Cloud
DR Low Drifting	GS Small Hail and/or Snow Pellets	FG Fog	+FC Tornado Waterspout
FZ Freezing	IC Ice Crystals	FU Smoke	PO Well-Developed Dust/Sand Whirls
MI Shallow	PL Ice Pellets	HZ Haze	
PR Partial	RA Rain		
SH Shower(s)	SG Snow Grains	PY Spray	SQ Squalls
TS Thunderstorm	SN Snow	SA Sand	SS Sandstorm
VC In the Vicinity	UP Unkown Precipitation	VA Volcanic Ash	GL Glaze

Intensity (as indicated on pages 4 to 6):
'+' = Heavy ' ' = Moderate '-' = Light

PHOENIX, AZ
JULY 2015

Sky Condition is based on the sum (not to exceed 8) of the sunrise to sunset cloud cover below and above 12,000 feet.

Clear = 0-2 oktas, Partly Cloudy = 3-6 oktas, Cloudy = 7-8 oktas.

A Heating (Cooling) Degree Day is the difference between the average daily temperature and 65 degrees F. The HDD season begins July 1, the CDD season begins January 1.

Snow Depth, Snowfall, and Sunshine data may come from nearby sites that the National Weather Service deems Climatologically representative of this site.

NORMALS ARE FOR THE YEARS 1981-2010

ADDITIONAL NOTES & ERRATA:

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Station Augmentation-CONTRACTOR
  Lat/Lon:33.44417/-112.02472 Elevation:1107FT
  Distance:.5 MI Dir:N
  Augmented Elements:Temp, Precip
  Equipment:MXMN, SRG
```

Date	VISIBILITY (MILES) MINIMUM	MAXIMUM
01	10.00	10.00
02	10.00	10.00
03	10.00	10.00
04	10.00	10.00
05	10.00	10.00
06	10.00	10.00
07	10.00	10.00
08	10.00	10.00
09	10.00	10.00
10	10.00	10.00
11	10.00	10.00
12	10.00	10.00
13	10.00	10.00
14	10.00	10.00
15	10.00	10.00
16	10.00	10.00
17	5.00	10.00
18	3.00	10.00
19	10.00	10.00
20	10.00	10.00
21	10.00	10.00
22	10.00	10.00
23	10.00	10.00
24	10.00	10.00
25	10.00	10.00
26	10.00	10.00
27	10.00	10.00
28	4.00	10.00
29	10.00	10.00
30	10.00	10.00
31	10.00	10.00
AVGS	9.42	10.00

MINIMUM VISIBILTY (MILES)

<= .25	<= 3.0	>= 7.0
0	1	28

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2015 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0522 JUL 01 SUNSET: 1942								
02	BKN	250	10.00		92	61	71	36	8	31	28.69	29.79
05	BKN	200	10.00		85	67	73	55	8	13	28.71	29.83
08	SCT	250	10.00		88	66	73	48	6	11	28.74	29.85
11	BKN	250	10.00		94	60	72	32	3	29	28.72	29.83
14	BKN	250	10.00		102	59	73	24	15	27	28.66	29.77
17	BKN	250	10.00		104	57	73	21	17	27	28.61	29.71
20	BKN	250	10.00		97	61	73	30	16	25	28.62	29.73
23	BKN	290	10.00		93	60	71	33	14	25	28.69	29.79
				SUNRISE: 0522 JUL 02 SUNSET: 1942								
02	SCT	250	10.00		91	58	70	33	10	26	28.70	29.81
05	BKN	200	10.00		88	58	69	36	8	26	28.70	29.82
08	SCT	250	10.00		91	57	69	32	8	28	28.73	29.84
11	FEW	100	10.00		98	57	71	25	6	VR	28.72	29.83
14	FEW	100	10.00		104	58	73	22	11	24	28.66	29.77
17	SCT	250	10.00		105	53	71	18	13	24	28.57	29.67
20	BKN	290	10.00		102	54	71	20	10	24	28.56	29.66
23	SCT	250	10.00		99	53	70	21	13	25	28.60	29.70
				SUNRISE: 0523 JUL 03 SUNSET: 1942								
02	BKN	250	10.00	-TSRA	95	60	72	31	6	16	28.63	29.73
05	BKN	250	10.00	TS	89	62	71	41	13	09	28.66	29.77
08	BKN	200	10.00		84	67	73	57	15	12	28.71	29.83
11	OVC	220	10.00		90	63	72	41	5	32	28.70	29.81
14	BKN	250	10.00		95	61	72	32	3	24	28.63	29.74
17	SCT	150	10.00		99	56	71	24	7	22	28.54	29.65
20	BKN	250	10.00		97	60	72	29	3	19	28.56	29.67
23	BKN	180	10.00		91	64	73	41	8	01	28.59	29.70
				SUNRISE: 0523 JUL 04 SUNSET: 1941								
02	SCT	250	10.00		89	65	73	45	6	24	28.57	29.67
05	BKN	180	10.00		86	64	71	48	3	24	28.57	29.67
08	BKN	250	10.00		91	62	72	38	8	09	28.63	29.73
11	BKN	250	10.00		98	62	74	31	9	19	28.66	29.76
14	SCT	250	10.00		104	55	72	20	11	26	28.61	29.71
17	BKN	250	10.00		105	54	72	18	23	27	28.56	29.67
20	BKN	250	10.00		101	53	70	20	13	29	28.58	29.69
23	BKN	180	10.00		97	56	70	25	0	00	28.62	29.72
				SUNRISE: 0524 JUL 05 SUNSET: 1941								
02	BKN	200	10.00		93	56	69	29	11	29	28.64	29.74
05	BKN	190	10.00		90	59	70	35	13	28	28.66	29.78
08	BKN	250	10.00		89	62	71	41	7	23	28.72	29.83
11	BKN	250	10.00		97	57	71	26	3	24	28.73	29.84
14	BKN	250	10.00		101	54	71	21	6	VR	28.66	29.78
17	BKN	190	10.00		92	65	74	41	22	19	28.68	29.78
20	BKN	190	10.00		85	67	73	55	14	10	28.70	29.83
23	BKN	190	10.00		85	64	71	50	7	11	28.76	29.87
				SUNRISE: 0524 JUL 06 SUNSET: 1941								
02	BKN	190	10.00		85	65	72	51	5	13	28.75	29.87
05	BKN	190	10.00	TS	84	66	72	55	9	24	28.78	29.90
08	SCT	160	10.00		83	66	72	57	5	07	28.78	29.91
11	FEW	160	10.00		94	64	74	37	6	VR	28.78	29.90
14	SCT	250	10.00		100	60	73	27	3	VR	28.70	29.82
17	SCT	250	10.00		103	55	72	20	11	28	28.63	29.73
20	BKN	250	10.00		101	58	72	24	9	25	28.63	29.73
23	SCT	250	10.00		96	53	69	23	8	29	28.66	29.78
				SUNRISE: 0525 JUL 07 SUNSET: 1941								
02	FEW	130	10.00		93	57	70	30	10	28	28.66	29.78
05	FEW	180	10.00		86	65	72	49	7	11	28.69	29.79
08	FEW	120	10.00		90	63	72	41	3	09	28.72	29.83
11	FEW	170	10.00		97	58	71	27	0	00	28.70	29.81
14	FEW	250	10.00		104	56	72	20	10	24	28.62	29.72
17	SCT	250	10.00		107	48	70	14	15	29	28.53	29.63
20	SCT	250	10.00		104	44	68	13	10	30	28.53	29.63
23	CLR	NC	10.00		98	44	66	16	13	26	28.56	29.66
				SUNRISE: 0525 JUL 08 SUNSET: 1941								
02	CLR	NC	10.00		93	44	64	18	11	34	28.56	29.66
05	FEW	200	10.00		88	48	64	25	6	15	28.59	29.69
08	FEW	130	10.00		90	50	66	25	9	12	28.63	29.73
11	BKN	250	10.00		101	44	67	14	9	16	28.61	29.70
14	FEW	120	10.00		105	43	68	12	11	22	28.53	29.62
17	FEW	120	10.00		107	44	69	12	16	24	28.46	29.57
20	FEW	120	10.00		100	44	66	15	13	25	28.49	29.59
23	CLR	NC	10.00		93	26	59	9	11	26	28.55	29.66
				SUNRISE: 0526 JUL 09 SUNSET: 1941								
02	CLR	NC	10.00		88	27	57	11	7	04	28.59	29.70
05	SCT	160	10.00		85	29	57	13	7	08	28.61	29.71
08	BKN	250	10.00		88	39	61	18	6	13	28.65	29.75
11	BKN	240	10.00		93	52	68	25	13	17	28.65	29.75
14	SCT	240	10.00		101	49	69	17	20	20	28.59	29.69
17	SCT	160	10.00		101	37	65	11	18	20	28.52	29.63
20	BKN	250	10.00		95	33	61	11	13	25	28.55	29.65
23	BKN	200	10.00		89	30	58	12	9	26	28.61	29.71
				SUNRISE: 0526 JUL 10 SUNSET: 1940								
02	SCT	200	10.00		84	35	58	17	6	14	28.63	29.73
05	FEW	120	10.00		81	39	58	22	0	00	28.66	29.77
08	FEW	250	10.00		86	49	64	28	7	13	28.71	29.82
11	SCT	250	10.00		95	49	67	21	11	16	28.69	29.81
14	FEW	250	10.00		99	46	67	16	14	18	28.63	29.73
17	SCT	160	10.00		102	48	69	16	15	21	28.56	29.66
20	SCT	200	10.00		95	52	68	23	21	29	28.58	29.69
23	FEW	200	10.00		91	55	68	30	14	28	28.66	29.76
				SUNRISE: 0527 JUL 11 SUNSET: 1940								
02	BKN	100	10.00		88	55	67	33	8	27	28.66	29.77
05	BKN	200	10.00		86	55	67	35	5	28	28.69	29.80
08	BKN	200	10.00		88	53	66	30	3	31	28.73	29.85
11	SCT	200	10.00		95	58	71	29	6	12	28.74	29.85
14	BKN	200	10.00		101	50	69	18	11	18	28.70	29.81
17	SCT	250	10.00		104	41	67	12	9	25	28.66	29.76
20	SCT	250	10.00		99	43	66	15	15	28	28.68	29.78
23	FEW	250	10.00		94	39	63	15	13	28	28.73	29.84
				SUNRISE: 0527 JUL 12 SUNSET: 1940								
02	FEW	180	10.00		90	40	62	17	5	33	28.74	29.85
05	FEW	180	10.00		85	41	60	21	0	00	28.76	29.87
08	BKN	230	10.00		89	33	59	14	6	31	28.79	29.91
11	BKN	250	10.00		97	35	63	11	6	VR	28.78	29.89
14	BKN	200	10.00		103	44	67	13	0	00	28.71	29.83
17	BKN	200	10.00		104	43	67	12	14	27	28.66	29.77
20	SCT	190	10.00		101	42	66	13	5	25	28.66	29.78
23	BKN	190	10.00		97	45	66	17	9	14	28.70	29.81

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2015 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0528 JUL 13 SUNSET: 1940								
02	SCT	230	10.00		91	59	70	34	8	12	28.69	29.80
05	BKN	230	10.00		90	60	70	37	0	00	28.71	29.83
08	BKN	250	10.00		91	59	70	34	9	11	28.73	29.85
11	SCT	160	10.00		99	56	71	24	9	09	28.71	29.82
14	SCT	250	10.00		105	54	72	18	7	29	28.63	29.74
17	BKN	250	10.00		107	48	70	14	15	29	28.55	29.65
20	BKN	250	10.00		104	46	68	14	13	30	28.56	29.66
23	BKN	250	10.00		95	57	70	28	13	13	28.63	29.73
				SUNRISE: 0528 JUL 14 SUNSET: 1939								
02	SCT	250	10.00		92	58	70	32	17	12	28.64	29.74
05	BKN	250	10.00		89	58	69	35	9	11	28.64	29.75
08	BKN	250	10.00		89	59	70	36	9	12	28.66	29.78
11	SCT	250	10.00		99	56	71	24	6	20	28.66	29.77
14	SCT	250	10.00		106	53	72	17	0	00	28.58	29.68
17	SCT	250	10.00		106	50	70	15	0	00	28.50	29.60
20	BKN	250	10.00		99	55	71	23	8	13	28.53	29.64
23	BKN	250	10.00		98	45	66	16	3	09	28.59	29.69
				SUNRISE: 0529 JUL 15 SUNSET: 1939								
02	BKN	250	10.00		91	59	70	34	8	09	28.61	29.71
05	BKN	250	10.00		89	56	68	33	8	14	28.66	29.76
08	SCT	250	10.00		91	56	69	31	11	14	28.70	29.81
11	FEW	120	10.00		98	58	72	26	17	19	28.72	29.83
14	FEW	110	10.00		103	55	72	20	8	22	28.66	29.76
17	FEW	160	10.00		105	55	72	19	0	00	28.58	29.68
20	BKN	250	10.00		102	54	71	20	6	31	28.59	29.69
23	SCT	250	10.00		98	54	70	23	10	26	28.64	29.74
				SUNRISE: 0530 JUL 16 SUNSET: 1938								
02	SCT	250	10.00		94	49	67	21	5	01	28.66	29.77
05	SCT	200	10.00		89	59	70	36	7	16	28.69	29.80
08	CLR	NC	10.00		90	58	69	34	5	12	28.73	29.84
11	FEW	120	10.00		99	47	67	17	0	00	28.72	29.83
14	FEW	100	10.00		105	47	69	14	3	VR	28.65	29.75
17	FEW	250	10.00		106	48	70	14	14	24	28.57	29.67
20	SCT	250	10.00		103	49	69	16	8	25	28.58	29.68
23	BKN	250	10.00		96	59	72	29	15	20	28.63	29.73
				SUNRISE: 0530 JUL 17 SUNSET: 1938								
02	SCT	250	10.00		90	61	71	38	8	09	28.66	29.76
05	BKN	250	10.00		88	60	70	39	0	00	28.66	29.78
08	SCT	160	10.00		91	59	70	34	8	17	28.71	29.82
11	SCT	150	10.00		95	59	71	30	17	15	28.73	29.84
14	SCT	160	10.00		101	58	72	24	10	17	28.66	29.78
17	SCT	160	10.00		100	58	72	25	14	15	28.59	29.69
20	BKN	220	10.00		97	58	71	27	9	20	28.61	29.72
23	SCT	150	10.00		84	67	73	57	6	VR	28.69	29.80
				SUNRISE: 0531 JUL 18 SUNSET: 1937								
02	SCT	250	10.00		84	66	72	55	0	00	28.69	29.80
05	BKN	250	10.00		83	64	70	53	6	13	28.73	29.84
08	BKN	250	10.00		84	64	71	51	8	14	28.78	29.90
11	BKN	200	10.00		93	63	73	37	9	16	28.78	29.90
14	SCT	250	10.00		98	60	73	28	7	23	28.71	29.83
17	OVC	240	10.00		90	63	72	41	16	24	28.69	29.81
20	BKN	250	10.00	-RA	85	65	72	51	14	30	28.77	29.89
23	OVC	085	10.00	-RA	77	69	72	77	7	04	28.84	29.96

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0532 JUL 19 SUNSET: 1937								
02	BKN	250	10.00		77	69	72	77	6	16	28.82	29.94
05	BKN	220	10.00		77	68	71	74	5	12	28.84	29.96
08	BKN	250	10.00		81	69	73	67	0	00	28.87	30.00
11	SCT	250	10.00		88	66	73	48	0	00	28.87	30.00
14	BKN	210	10.00		93	63	73	37	3	VR	28.82	29.94
17	SCT	210	10.00		96	61	73	31	6	24	28.75	29.88
20	SCT	210	10.00		93	63	73	37	14	28	28.76	29.88
23	BKN	250	10.00		91	63	72	39	14	27	28.80	29.92
				SUNRISE: 0532 JUL 20 SUNSET: 1937								
02	SCT	250	10.00		88	62	71	42	9	28	28.78	29.90
05	BKN	240	10.00		84	65	71	53	3	23	28.79	29.91
08	BKN	200	10.00		88	64	72	45	3	18	28.80	29.92
11	BKN	200	10.00		93	64	73	38	6	16	28.80	29.91
14	FEW	200	10.00		99	58	72	26	7	VR	28.74	29.85
17	FEW	230	10.00		101	60	73	26	13	27	28.66	29.77
20	FEW	090	10.00		97	56	70	25	8	24	28.65	29.76
23	FEW	090	10.00		92	57	69	31	6	24	28.66	29.78
				SUNRISE: 0533 JUL 21 SUNSET: 1936								
02	FEW	090	10.00		90	58	69	34	6	24	28.66	29.76
05	CLR	NC	10.00		86	62	70	45	5	24	28.66	29.77
08	CLR	NC	10.00		90	61	71	38	0	00	28.68	29.79
11	FEW	085	10.00		98	58	72	26	6	18	28.68	29.78
14	SCT	100	10.00		103	56	72	21	5	VR	28.63	29.73
17	SCT	100	10.00		103	56	72	21	9	27	28.54	29.64
20	FEW	170	10.00		101	52	70	19	14	28	28.54	29.64
23	CLR	NC	10.00		97	53	69	23	6	24	28.58	29.69
				SUNRISE: 0534 JUL 22 SUNSET: 1935								
02	FEW	250	10.00		92	48	66	22	9	28	28.60	29.71
05	FEW	200	10.00		87	50	65	28	3	06	28.63	29.74
08	FEW	230	10.00		90	47	64	23	6	VR	28.68	29.79
11	FEW	230	10.00		96	42	65	15	0	00	28.68	29.78
14	SCT	230	10.00		103	42	67	12	13	15	28.62	29.72
17	SCT	230	10.00		103	40	66	11	8	33	28.55	29.65
20	SCT	250	10.00		102	46	68	15	8	26	28.56	29.67
23	CLR	NC	10.00		96	46	66	18	16	28	28.64	29.74
				SUNRISE: 0534 JUL 23 SUNSET: 1935								
02	FEW	120	10.00		90	44	63	20	0	00	28.68	29.78
05	FEW	140	10.00		88	35	60	15	3	29	28.71	29.83
08	BKN	250	10.00		91	38	62	15	3	15	28.77	29.88
11	BKN	250	10.00		97	40	64	14	6	12	28.78	29.89
14	SCT	250	10.00		100	50	69	18	6	VR	28.72	29.83
17	SCT	250	10.00		102	47	68	15	0	00	28.66	29.77
20	BKN	250	10.00		101	47	68	16	6	34	28.69	29.80
23	BKN	230	10.00		91	63	72	39	8	17	28.75	29.87
				SUNRISE: 0535 JUL 24 SUNSET: 1934								
02	BKN	230	10.00		87	64	72	46	7	11	28.76	29.87
05	BKN	230	10.00		87	64	72	46	6	16	28.79	29.90
08	BKN	250	10.00		87	65	72	48	7	27	28.83	29.95
11	BKN	180	10.00		93	60	71	33	3	36	28.83	29.95
14	BKN	220	10.00		99	56	71	24	6	VR	28.78	29.89
17	SCT	250	10.00		103	52	70	18	14	31	28.69	29.80
20	SCT	250	10.00		100	48	68	17	9	25	28.69	29.79
23	FEW	140	10.00		95	52	68	23	6	26	28.71	29.83

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2015 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0536		**JUL 25**			**SUNSET: 1934**						
02	FEW	230	10.00		90	51	66	26	0	00	28.70	29.81
05	FEW	230	10.00		90	48	65	24	7	30	28.71	29.83
08	BKN	230	10.00		90	47	65	23	6	32	28.76	29.87
11	SCT	230	10.00		100	40	65	13	7	VR	28.74	29.85
14	SCT	200	10.00		106	30	65	7	6	VR	28.69	29.79
17	SCT	210	10.00		108	29	65	6	18	27	28.61	29.70
20	SCT	210	10.00		103	29	63	7	8	24	28.59	29.70
23	FEW	210	10.00		97	36	63	12	8	24	28.61	29.71
	SUNRISE: 0536		**JUL 26**			**SUNSET: 1933**						
02	SCT	210	10.00		90	37	61	15	5	25	28.58	29.69
05	BKN	170	10.00		87	43	62	21	6	09	28.61	29.72
08	BKN	200	10.00		88	41	62	19	6	11	28.66	29.77
11	BKN	200	10.00		101	37	65	11	6	23	28.68	29.78
14	BKN	200	10.00		106	34	65	8	16	29	28.62	29.72
17	BKN	200	10.00		107	30	65	7	14	26	28.55	29.65
20	BKN	250	10.00		102	40	66	12	10	24	28.55	29.65
23	BKN	250	10.00		98	41	65	14	9	27	28.59	29.69
	SUNRISE: 0537		**JUL 27**			**SUNSET: 1932**						
02	SCT	250	10.00		93	52	67	25	9	29	28.60	29.70
05	SCT	250	10.00		87	54	67	32	3	VR	28.63	29.73
08	FEW	250	10.00		90	55	68	31	7	12	28.68	29.78
11	FEW	250	10.00		97	50	68	20	6	29	28.66	29.78
14	FEW	250	10.00		102	50	69	17	5	29	28.62	29.72
17	FEW	250	10.00		104	52	71	18	9	28	28.56	29.66
20	FEW	250	10.00		103	52	70	18	11	28	28.56	29.67
23	FEW	200	10.00		98	57	71	25	14	26	28.61	29.71
	SUNRISE: 0538		**JUL 28**			**SUNSET: 1932**						
02	FEW	150	10.00		93	57	70	30	11	26	28.62	29.72
05	SCT	150	10.00		90	58	69	34	8	29	28.65	29.75
08	BKN	250	10.00		92	58	70	32	6	36	28.70	29.81
11	SCT	190	10.00		96	56	70	26	5	VR	28.70	29.81
14	SCT	250	10.00		103	54	71	20	10	30	28.65	29.75
17	BKN	250	10.00		104	51	70	17	9	29	28.58	29.68
20	BKN	250	10.00		102	55	71	21	6	21	28.61	29.71
23	BKN	250	10.00		90	62	71	39	20	16	28.70	29.81
	SUNRISE: 0538		**JUL 29**			**SUNSET: 1931**						
02	BKN	250	10.00		88	62	71	42	6	12	28.71	29.83
05	BKN	200	10.00		87	61	70	42	0	00	28.72	29.84
08	BKN	210	10.00		88	62	71	42	8	14	28.78	29.89
11	BKN	210	10.00		93	62	72	36	6	24	28.80	29.91
14	BKN	180	10.00		96	63	74	34	5	26	28.76	29.88
17	BKN	190	10.00		99	61	73	29	14	31	28.69	29.80
20	BKN	190	10.00		92	60	71	34	23	08	28.76	29.88
23	SCT	190	10.00		88	62	71	42	18	07	28.79	29.91
	SUNRISE: 0539		**JUL 30**			**SUNSET: 1930**						
02	BKN	270	10.00		87	62	71	43	11	06	28.78	29.90
05	OVC	250	10.00		86	63	71	46	9	06	28.78	29.89
08	BKN	250	10.00		88	63	71	43	10	08	28.83	29.95
11	SCT	250	10.00		95	61	72	32	7	VR	28.83	29.94
14	SCT	250	10.00		103	59	74	24	8	14	28.76	29.87
17	SCT	250	10.00		104	53	71	18	3	VR	28.68	29.78
20	BKN	250	10.00		102	55	71	21	5	24	28.69	29.80
23	BKN	250	10.00		98	58	72	26	11	33	28.73	29.85

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0540		**JUL 31**			**SUNSET: 1929**						
02	OVC	250	10.00		95	59	71	30	9	26	28.73	29.83
05	BKN	250	10.00		90	60	70	37	0	00	28.74	29.85
08	SCT	220	10.00		93	60	71	33	0	00	28.78	29.90
11	BKN	250	10.00		102	58	73	23	10	16	28.77	29.88
14	BKN	250	10.00		107	57	74	19	7	29	28.69	29.80
17												
20												
23												

3-HOURLY OBSERVATION NOTES

Sky Cover is the amount of the sky obscured. CLR or SKC = 0, FEW = 1/8-2/8, SCT = 3/8-4/8, BKN = 5/8-7/8, OVC = 8/8, W = Vertical Visibility = 8/8

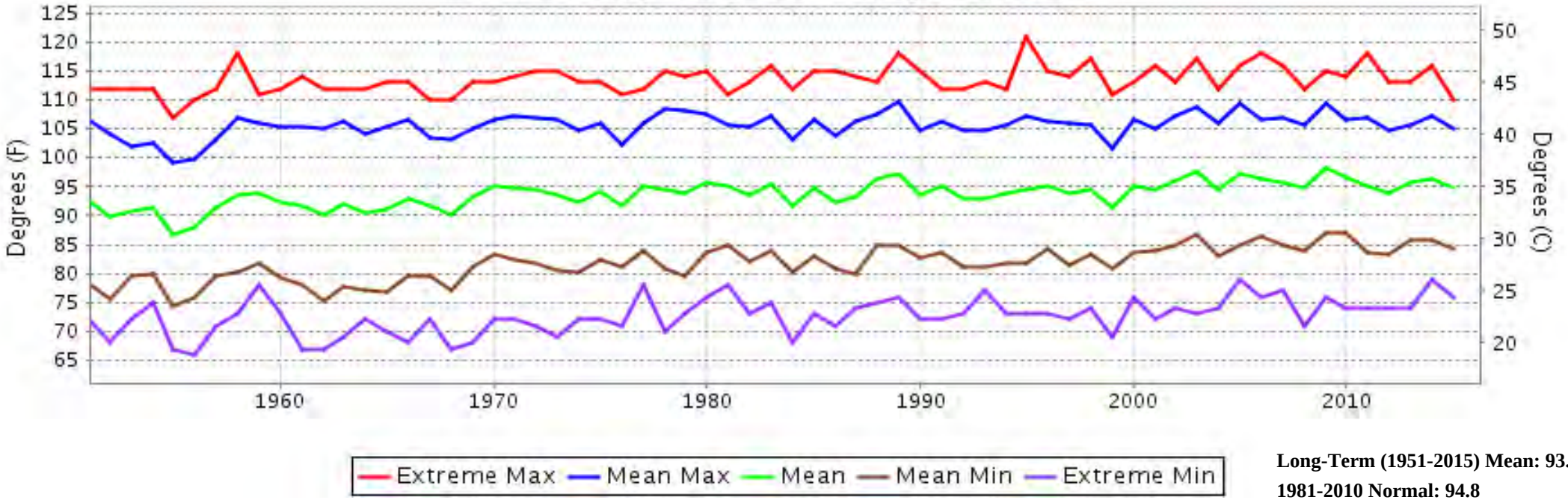
Ceiling is reported in hundreds of feet above ground level for clouds at or below 12,000 feet. NC = No Ceiling detected.

& = Original observation containted additional weather elements. See page 3 for additional notes.

SUMMARY BY HOUR

HOUR (LST)	AVERAGES DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY	PRESSURE (Inches, HG) STATION	SEA LEVEL	VISIBILITY (Miles)	WIND SPEED (MPH)	RESULTANT WIND (MPH) SPEED	DIRECTION
01	91	55	68	32	28.67	29.78	10.00	8	3	25
02	90	55	68	33	28.67	29.78	10.00	7	2	23
03	89	56	68	35	28.68	29.78	10.00	7	1	21
04	88	56	68	36	28.68	29.79	10.00	6	1	21
05	87	56	68	38	28.69	29.80	10.00	5	2	15
06	86	57	68	39	28.71	29.82	10.00	6	2	13
07	87	57	68	38	28.72	29.83	10.00	6	3	11
08	89	57	69	36	28.73	29.84	10.00	6	3	11
09	91	56	69	33	28.74	29.85	10.00	6	3	11
10	94	56	70	30	28.73	29.85	10.00	6	2	19
11	96	55	70	26	28.73	29.84	10.00	7	2	16
12	99	54	70	24	28.72	29.83	10.00	7	2	19
13	100	53	71	22	28.69	29.80	10.00	7	3	24
14	102	53	71	20	28.67	29.77	10.00	8	5	25
15	103	52	70	19	28.64	29.75	10.00	9	7	26
16	103	51	70	19	28.62	29.72	10.00	11	8	26
17	103	51	70	19	28.60	29.70	10.00	12	10	26
18	102	50	70	19	28.59	29.70	10.00	11	10	26
19	101	51	70	20	28.60	29.71	10.00	12	9	26
20	99	51	69	22	28.61	29.72	10.00	11	7	26
21	97	52	69	24	28.63	29.74	10.00	9	6	26
22	95	53	69	27	28.66	29.77	9.40	10	5	26
23	93	53	69	28	28.66	29.77	10.00	10	5	26
24	92	54	68	30	28.67	29.78	10.00	9	3	25

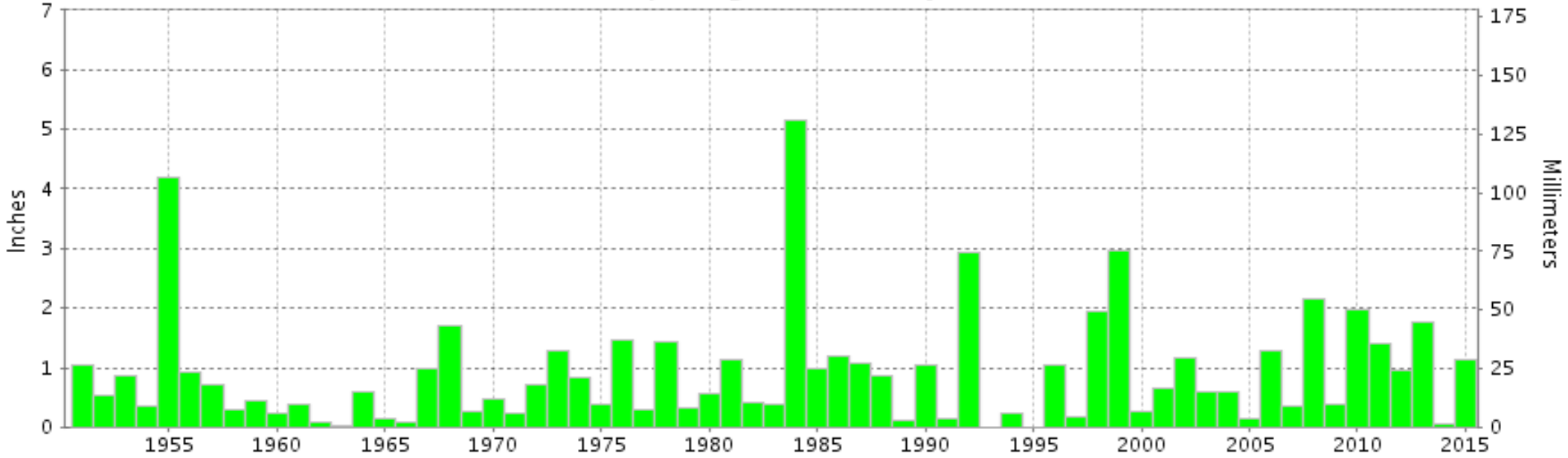
PHOENIX, AZ JULY Temperatures



Long-Term (1951-2015) Mean: 93.7

1981-2010 Normal: 94.8

PHOENIX, AZ JULY Precipitation



Long-Term (1951-2015) Mean Monthly Total: 0.91 **1981-2010 Normal: 1.05**

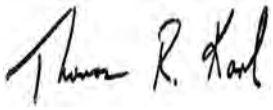
Published By:National Centers for Environmental Information

JULY 2015
PHOENIX, AZ

LOCAL CLIMATOLOGICAL DATA

NOAA, National Centers for Environmental Information

I certify that this is an official publication of the National Oceanic and Atmospheric Administration (NOAA). It is compiled using information from weather observing sites operated by NOAA-National Weather Service / Department Of Transportation-Federal Aviation Administration and received at the National Centers for Environmental Information (NCEI), Asheville, North Carolina 28801.



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JULY 2014
LOCAL CLIMATOLOGICAL DATA
NOAA, National Climatic Data Center

PHOENIX, AZ
PHOENIX SKY HARBOR INTL AIRPORT (KPHX)
Lat:33° 25'N Long: 112° 0'W Elev (Ground) 1107 Feet
Time Zone : MOUNTAIN WBAN: 23183 ISSN#: 0198-0475

Date	Temperature °F						Deg Days BASE 65°		WEATHER	SNOW/ICE ON GND(IN)		PRECIPITATION ON GND(IN)		PRESSURE (INCHES OF HG)		WIND SPEED = MPH DIR = TENS OF DEGREES							Date
										0500 LST	1100 LST	2400 LST	2400 LST						MAXIMUM 3-SEC		2-MIN		
	MAXIMUM	MINIMUM	AVERAGE	DEP FROM NORMAL	AVERAGE DEW PT	AVERAGE WET BULB	HEATING	COOLING		DEPTH	WATER-EQUIV	SNOW-FALL	WATER EQUIV	AVERAGE STATION	AVERAGE SEA LEVEL	RESULTANT SPEED	RES DIR	AVERAGE SPEED	SPEED	DIR	SPEED	DIR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	109	86	98	6	40	65	0	33					0.00	28.58	29.68	3.2	27	6.3	22	27	17	28	01
02	109	86	98	6	42	65	0	33					0.00	28.62	29.73	3.6	29	6.0	21	28	16	28	02
03	108	79*	94	2	56	70	0	29	TSRA RA DS BLDU SQ				T	28.71	29.81	3.2	24	8.3	56	15	44*	15	03
04	98	81	90*	-2	63	72	0	25					0.00	28.78	29.91	2.0	30	5.5	18	27	14	28	04
05	103	84	94	2	62	72	0	29	RA				0.01	28.78	29.90	2.3	26	7.8	38	28	30	27	05
06	105	84	95	2	61	72	0	30					0.00	28.69	29.81	2.4	28	6.9	29	32	25	30	06
07	108	88	98	5	61	72	0	33					0.00	28.63	29.73	2.2	13	7.0	30	14	22	14	07
08	105	86	96	3	62	73	0	31	TS RA				T	28.68	29.79	3.5	22	8.4	33	29	28	30	08
09	101	83	92	-1	62	72	0	27	RA				T	28.69	29.82	2.1	24	6.7	23	31	17	26	09
10	105	87	96	3	60	72	0	31					0.00	28.64	29.76	7.0	27	8.0	27	27	20	28	10
11	107	88	98	5	53	70	0	33					0.00	28.66	29.77	6.2	28	7.7	25	29	21	27	11
12	110	88	99	6	53	70	0	34					0.00	28.67	29.78	4.5	14	8.3	24	11	20	12	12
13	110	80	95	2	61	73	0	30	TS TSRA RA				0.03	28.69	29.79	9.1	13	10.8	56*	14	41	15	13
14	103	81	92	-1	66	74	0	27	TS RA				0.02	28.76	29.88	2.0	07	7.3	34	03	28	03	14
15	103	86	95	2	63	73	0	30	RA				T	28.74	29.87	5.3	12	6.7	30	03	25	04	15
16	107	84	96	3	58	71	0	31					0.00	28.66	29.77	1.4	20	7.3	29	27	23	28	16
17	105	86	96	3	45	66	0	31					0.00	28.64	29.75	3.1	27	6.9	22	27	17	27	17
18	105	83	94	1	41	64	0	29					0.00	28.68	29.80	2.3	31	6.3	21	27	18	27	18
19	104	88	96	3	46	66	0	31	RA				T	28.69	29.80	5.2	28	6.5	20	32	16	30	19
20	106	85	96	3	37	63	0	31					0.00	28.71	29.82	2.2	26	6.1	19	30	14	27	20
21	107	85	96	3	41	65	0	31					0.00	28.74	29.85	3.9	27	5.7	22	27	15	27	21
22	113	89	101	8	48	68	0	36					0.00	28.69	29.81	4.9	27	6.6	23	28	18	29	22
23	114	94	104	11	54	72	0	39					0.00	28.66	29.77	5.1	11	7.4	28	03	25	03	23
24	116*	93	105*	12	53	72	0	40	RA				T	28.60	29.72	3.9	15	9.5	26	19	21	19	24
25	109	87	98	5	62	73	0	33	RA BLDU				T	28.67	29.78	4.3	17	10.6	46	19	32	18	25
26	108	83	96	3	60	72	0	31	RA				T	28.69	29.81	2.9	22	9.6	38	07	31	07	26
27	104	83	94	1	59	71	0	29	TS RA				T	28.76	29.86	3.0	28	10.7	32	13	26	13	27
28	107	85	96	3	58	71	0	31					0.00	28.77	29.90	2.6	14	6.8	21	32	16	12	28
29	110	92	101	8	56	71	0	36					0.00	28.71	29.82	6.1	27	7.9	24	27	20	27	29
30	111	92	102	9	52	70	0	37					0.00	28.64	29.76	3.5	26	5.4	20	27	16	27	30
31	109	87	98	5	55	71	0	33	TS TSRA RA				T	28.67	29.78	1.3	02	8.3	34	29	28	29	31
	107.1	85.9	96.5	¤	54.5	70.0	0.0	31.7	< MONTHLY AVERAGES | TOTALS >				0.06	28.69	29.80	1.6	24	7.5	< MONTHLY AVERAGES				
	1.0	2.4	1.7		<---------- DEPARTURE FROM NORMAL ---------->								-0.99	SUNSHINE, CLOUD, & VISIBILITY TABLES ON PAGE 3									

JULY 2014
PHOENIX, AZ

DEGREE DAYS

	MONTHLY TOTAL	MONTHLY DEPARTURE	SEASON TO DATE TOTAL	SEASON TO DATE DEPARTURE
HEATING :	0	0	0	0
COOLING :	984	60	2914	330

GREATEST 24-HR PRECIPITATION : 0.05 DATE : 13-14
GREATEST 24-HR SNOWFALL : DATE :
GREATEST SNOW DEPTH : DATE :

SEA LEVEL PRESSURE		DATE	TIME
MAXIMUM :	30.00	27	0751
MIMIMUM :	29.62	24	1851

NUMBER OF -> DAYS WITH

MAXIMUM TEMP >= 90 :	31	MINIMUM TEMP <= 32 :	0
MAXIMUM TEMP <= 32 :	0	MINIMUM TEMP <= 0 :	0
THUNDERSTORMS :	6	HEAVY FOG :	0

PRECIPITATION >= 0.01 INCH:	3
PRECIPITATION >= 0.10 INCH:	0
SNOWFALL >= 1.0 INCH :	

HOURLY PRECIPITATION
(WATER EQUIVALENT IN INCHES)

PHOENIX, AZ (KPHX)
JULY 2014

WBAN # 23183

Date	FOR HOUR (LST) ENDING AT												Date	FOR HOUR (LST) ENDING AT												Date	Sum of Hourly Data	2400 LST Water Equiv.
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	23	24				
01													01													01	0.00	0.00
02													02													02	0.00	0.00
03													03									T	T			03	T	T
04													04													04	0.00	0.00
05	0.01	T											05													05	0.01	0.01
06													06													06	0.00	0.00
07													07													07	0.00	0.00
08													08											T	T	08	T	T
09		T	T										09													09	T	T
10													10													10	0.00	0.00
11													11													11	0.00	0.00
12													12													12	0.00	0.00
13													13						T	T			T	0.03	T	13	0.03	0.03
14		T											14							0.02						14	0.02	0.02
15													15						T							15	T	T
16													16													16	0.00	0.00
17													17													17	0.00	0.00
18													18													18	0.00	0.00
19				T	T								19													19	T	T
20													20													20	0.00	0.00
21													21													21	0.00	0.00
22													22													22	0.00	0.00
23													23													23	0.00	0.00
24			T										24													24	T	T
25													25									T				25	T	T
26													26												T	26	T	T
27	T												27													27	T	T
28													28													28	0.00	0.00
29													29													29	0.00	0.00
30													30													30	0.00	0.00
31													31											T	T	31	T	T

*** Indicates sum of Hourly and Daily disagree.**

MAXIMUM SHORT DURATION PRECIPITATION (See Note)

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (Inches)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Ending Date	13	13	13	13	13	13	13	13	13	13	13	13
Ending Time (Hr/Min)	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250

Date and time are not entered for TRACE amounts.

Note : The hourly and daily precipitation totals are printed in the last 2 columns and hi-lighted in red when they disagree. NWS does not edit ASOS hourly values but may edit daily and monthly totals. Hourly, daily, and monthly totals are printed as reported by the ASOS site.

REFERENCE NOTES & SUPPLEMENTAL SUMMARIES

*** = Extreme for the month (last occurence if more than one).**

T = Trace precipitation amount.

+ = also occurs on earlier date.

FG+ = Heavy fog, visibility .25 miles or less.

BLANK entries denote missing or unreported data.

Resultant wind is the vector sum of the wind speeds and directions divided by the number of observations.

Wind direction is recorded in tens of degrees (2 digits) clockwise from true north. '00' = calm, 'VR' = variable.

Precipitation is for the 24-hour period ending at the time indicated in the column heading.

Ceilometer (30-second) data are used to derive cloudiness at or below 12,000 feet. This cloudiness is the mean cloud cover detected during sunrise to sunset (SR-SS), or midnight to midnight (MN-MN).

WEATHER NOTATIONS

QUALIFIER	WEATHER PHENOMENA		
DESCRIPTOR	PRECIPITATION	OBSCURATION	OTHER
BC Patches	DZ Drizzle	BR Mist	DS Duststorm
BL Blowing	GR Hail	DU Widespread Dust	FC Funnel Cloud
DR Low Drifting	GS Small Hail and/or Snow Pellets	FG Fog	+FC Tornado Waterspout
FZ Freezing	IC Ice Crystals	FU Smoke	PO Well-Developed Dust/Sand Whirls
MI Shallow	PL Ice Pellets	HZ Haze	
PR Partial	RA Rain		
SH Shower(s)	SG Snow Grains	PY Spray	SQ Squalls
TS Thunderstorm	SN Snow	SA Sand	SS Sandstorm
VC In the Vicinity	UP Unkown Precipitation	VA Volcanic Ash	GL Glaze

Intensity (as indicated on pages 4 to 6):
'+' = Heavy ' ' = Moderate '-' = Light

PHOENIX, AZ
JULY 2014

Sky Condition is based on the sum (not to exceed 8) of the sunrise to sunset cloud cover below and above 12,000 feet.

Clear = 0-2 oktas, Partly Cloudy = 3-6 oktas, Cloudy = 7-8 oktas.

A Heating (Cooling) Degree Day is the difference between the average daily temperature and 65 degrees F. The HDD season begins July 1, the CDD season begins January 1.

Snow Depth, Snowfall, and Sunshine data may come from nearby sites that the National Weather Service deems Climatologically representative of this site.

NORMALS ARE FOR THE YEARS 1981-2010

ADDITIONAL NOTES & ERRATA:

```
Station Augmentation-CONTRACTOR
  Lat/Lon:33.44417/-112.02472 Elevation:1107FT
  Distance:.5 MI Dir:N
  Augmented Elements:Temp, Precip
  Equipment:MXMN, SRG
```

Date	VISIBILITY (MILES) MINIMUM	MAXIMUM
01	10.00	10.00
02	10.00	10.00
03	1.00	10.00
04	10.00	10.00
05	8.00	10.00
06	10.00	10.00
07	10.00	10.00
08	10.00	10.00
09	9.00	10.00
10	10.00	10.00
11	10.00	10.00
12	10.00	10.00
13	4.00	10.00
14	10.00	10.00
15	10.00	10.00
16	10.00	10.00
17	10.00	10.00
18	10.00	10.00
19	10.00	10.00
20	10.00	10.00
21	10.00	10.00
22	10.00	10.00
23	10.00	10.00
24	10.00	10.00
25	1.75	10.00
26	4.00	10.00
27	10.00	10.00
28	10.00	10.00
29	10.00	10.00
30	10.00	10.00
31	10.00	10.00
AVGS	8.96	10.00

MINIMUM VISIBILTY (MILES)

<= .25	<= 3.0	>= 7.0
0	2	27

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2014 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0522 JUL 01 SUNSET: 1942								
02	CLR	NC	10.00		96	45	66	17	7	30	28.55	29.65
05	FEW	090	10.00		86	47	63	26	5	11	28.60	29.70
08	FEW	130	10.00		90	42	63	19	6	10	28.66	29.76
11	FEW	180	10.00		100	40	65	13	0	00	28.66	29.76
14	SCT	250	10.00		106	33	65	8	6	VR	28.58	29.68
17	SCT	250	10.00		109	33	66	7	11	25	28.54	29.64
20	BKN	290	10.00		105	35	65	9	13	27	28.52	29.62
23	SCT	250	10.00		97	41	65	14	0	00	28.54	29.64
				SUNRISE: 0522 JUL 02 SUNSET: 1942								
02	FEW	250	10.00		96	42	65	15	10	31	28.57	29.67
05	FEW	110	10.00		88	43	62	21	8	24	28.62	29.72
08	FEW	130	10.00		92	41	63	17	3	24	28.70	29.81
11	FEW	170	10.00		100	40	65	13	6	02	28.71	29.82
14	FEW	170	10.00		107	39	67	10	3	VR	28.64	29.74
17	FEW	170	10.00		108	37	67	9	11	30	28.56	29.66
20	FEW	170	10.00		105	45	68	13	7	27	28.56	29.66
23	CLR	NC	10.00		98	48	67	18	3	21	28.61	29.71
				SUNRISE: 0523 JUL 03 SUNSET: 1942								
02	CLR	NC	10.00		93	51	67	24	5	08	28.65	29.75
05	FEW	150	10.00		91	54	68	28	8	31	28.70	29.81
08	FEW	250	10.00		93	58	70	31	0	00	28.75	29.86
11	SCT	250	10.00		99	55	71	23	0	00	28.74	29.85
14	BKN	250	10.00		105	53	71	18	11	31	28.66	29.77
17	SCT	250	10.00		107	52	72	16	8	25	28.60	29.70
20	OVC	017	1.00	DS SQ	93	60	71	33	33	16	28.69	29.80
23	OVC	190	10.00		85	64	71	50	15	31	28.82	29.93
				SUNRISE: 0523 JUL 04 SUNSET: 1941								
02	BKN	160	10.00		82	68	73	63	11	30	28.83	29.95
05	OVC	200	10.00		82	67	72	60	0	00	28.81	29.93
08	BKN	180	10.00		85	66	72	53	0	00	28.83	29.95
11	OVC	200	10.00		87	66	73	50	5	20	28.83	29.96
14	BKN	160	10.00		93	58	70	31	8	28	28.79	29.91
17	SCT	200	10.00		97	56	70	25	7	32	28.72	29.84
20	SCT	200	10.00		96	59	72	29	7	31	28.74	29.85
23	BKN	200	10.00		95	58	71	29	3	11	28.78	29.89
				SUNRISE: 0524 JUL 05 SUNSET: 1941								
02	BKN	120	10.00		85	68	73	57	6	18	28.80	29.92
05	BKN	160	10.00		86	61	70	43	7	08	28.81	29.93
08	BKN	160	10.00		89	60	70	38	7	08	28.86	29.97
11	SCT	180	10.00		95	59	71	30	3	25	28.84	29.96
14	SCT	180	10.00		99	60	73	28	5	VR	28.77	29.89
17	SCT	180	8.00		101	60	73	26	9	26	28.69	29.80
20	BKN	200	10.00		100	58	72	25	17	27	28.72	29.83
23	OVC	250	10.00		92	65	74	41	11	13	28.80	29.92
				SUNRISE: 0524 JUL 06 SUNSET: 1941								
02	OVC	250	10.00		84	61	69	46	8	12	28.78	29.89
05	BKN	250	10.00		84	63	70	49	0	00	28.76	29.88
08	SCT	250	10.00		87	63	71	45	5	VR	28.78	29.90
11	BKN	250	10.00		96	60	72	30	6	VR	28.76	29.88
14	BKN	220	10.00		101	57	72	23	0	00	28.66	29.78
17	BKN	250	10.00		102	56	72	22	5	VR	28.60	29.70
20	BKN	200	10.00		94	61	72	33	14	32	28.62	29.72
23	BKN	200	10.00		91	64	73	41	9	27	28.65	29.75
				SUNRISE: 0525 JUL 07 SUNSET: 1941								
02	SCT	200	10.00		89	62	71	41	0	00	28.62	29.72
05	BKN	200	10.00		89	61	71	39	0	00	28.66	29.76
08	SCT	250	10.00		92	63	73	38	6	10	28.69	29.80
11	SCT	180	10.00		98	60	73	28	5	07	28.68	29.79
14	SCT	250	10.00		106	58	74	21	7	12	28.60	29.70
17	SCT	160	10.00		107	53	72	17	11	24	28.55	29.65
20	SCT	160	10.00		97	62	73	32	11	16	28.61	29.71
23	BKN	250	10.00		89	66	73	47	11	13	28.66	29.77
				SUNRISE: 0525 JUL 08 SUNSET: 1941								
02	SCT	250	10.00		88	65	73	46	8	16	28.66	29.77
05	BKN	250	10.00		87	64	72	46	11	13	28.69	29.80
08	BKN	250	10.00		89	64	72	43	7	15	28.74	29.85
11	BKN	250	10.00		96	63	74	34	0	00	28.73	29.85
14	BKN	220	10.00		101	62	74	28	11	28	28.68	29.78
17	BKN	220	10.00		103	61	74	25	11	29	28.60	29.70
20	BKN	190	10.00		102	57	72	23	11	30	28.64	29.74
23	OVC	220	10.00	-RA	90	66	74	45	13	18	28.71	29.83
				SUNRISE: 0526 JUL 09 SUNSET: 1941								
02	OVC	220	10.00	-RA	86	66	73	51	6	13	28.74	29.85
05	OVC	250	10.00		84	66	72	55	0	00	28.75	29.86
08	BKN	250	10.00		86	65	72	49	8	12	28.76	29.88
11	BKN	250	10.00		92	63	73	38	3	VR	28.76	29.88
14	BKN	190	10.00		95	63	73	35	9	17	28.70	29.82
17	BKN	190	10.00		99	59	72	27	13	31	28.62	29.73
20	SCT	190	10.00		97	58	71	27	11	26	28.65	29.75
23	FEW	250	10.00		92	60	71	34	7	26	28.69	29.80
				SUNRISE: 0526 JUL 10 SUNSET: 1940								
02	FEW	250	10.00		90	60	70	37	7	33	28.66	29.77
05	BKN	250	10.00		88	62	71	42	8	29	28.68	29.78
08	BKN	180	10.00		88	64	72	45	3	26	28.72	29.83
11	SCT	180	10.00		95	62	73	34	7	31	28.71	29.83
14	SCT	250	10.00		100	59	73	26	6	23	28.64	29.74
17	SCT	250	10.00		103	58	73	23	8	26	28.58	29.68
20	BKN	200	10.00		101	57	72	23	16	28	28.60	29.70
23	BKN	250	10.00		99	57	71	25	10	28	28.65	29.75
				SUNRISE: 0527 JUL 11 SUNSET: 1940								
02	SCT	250	10.00		94	61	72	33	10	27	28.65	29.75
05	SCT	250	10.00		91	58	70	33	3	24	28.69	29.80
08	FEW	250	10.00		92	57	70	31	5	03	28.71	29.83
11	SCT	250	10.00		99	56	71	24	3	VR	28.71	29.82
14	SCT	250	10.00		104	53	71	18	5	30	28.66	29.76
17	SCT	250	10.00		105	49	70	15	10	30	28.61	29.71
20	BKN	250	10.00		102	50	69	17	10	27	28.62	29.72
23	BKN	250	10.00		98	40	65	13	10	27	28.66	29.77
				SUNRISE: 0527 JUL 12 SUNSET: 1940								
02	BKN	250	10.00		93	39	63	15	8	16	28.69	29.78
05	BKN	250	10.00		89	59	70	36	9	10	28.69	29.80
08	BKN	250	10.00		91	60	71	35	7	13	28.72	29.83
11	BKN	250	10.00		101	49	69	17	0	00	28.72	29.83
14	SCT	250	10.00		106	43	68	12	6	VR	28.66	29.77
17	BKN	250	10.00		107	47	70	13	6	01	28.62	29.72
20	BKN	250	10.00		98	60	73	28	8	12	28.62	29.72
23	OVC	200	10.00		97	58	71	27	13	11	28.69	29.79

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2014 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0528 JUL 13 SUNSET: 1940								
02	BKN	200	10.00		93	60	71	33	6	15	28.68	29.78
05	BKN	210	10.00		91	62	72	38	9	09	28.69	29.80
08	SCT	230	10.00		93	62	72	36	11	12	28.72	29.83
11	SCT	250	10.00		102	59	73	24	9	15	28.70	29.81
14	SCT	250	10.00		108	56	73	18	11	16	28.65	29.75
17	SCT	100	10.00		106	55	72	19	31	10	28.62	29.72
20	BKN	140	10.00		93	62	72	36	11	09	28.64	29.74
23	OVC	190	4.00	TSRA	80	71	74	74	24	17	28.78	29.89
				SUNRISE: 0528 JUL 14 SUNSET: 1939								
02	OVC	190	10.00		83	67	72	59	5	34	28.78	29.89
05	BKN	200	10.00		82	69	73	65	3	24	28.78	29.89
08	BKN	250	10.00		85	68	73	57	5	13	28.80	29.92
11	SCT	250	10.00		94	67	75	41	8	16	28.81	29.93
14	SCT	250	10.00		99	63	74	31	6	VR	28.75	29.86
17	BKN	250	10.00		102	63	75	28	9	35	28.70	29.81
20	BKN	130	10.00		92	63	73	38	9	36	28.72	29.84
23	BKN	230	10.00		91	62	72	38	13	08	28.75	29.87
				SUNRISE: 0529 JUL 15 SUNSET: 1939								
02	SCT	160	10.00		89	62	71	41	3	07	28.76	29.88
05	BKN	220	10.00		87	65	72	48	3	13	28.78	29.89
08	BKN	220	10.00		89	63	72	42	0	00	28.82	29.94
11	BKN	210	10.00		95	61	72	32	0	00	28.80	29.92
14	SCT	210	10.00		99	59	72	27	0	00	28.74	29.85
17	BKN	250	10.00		96	66	75	37	10	12	28.69	29.81
20	BKN	250	10.00		93	65	74	40	9	16	28.69	29.79
23	BKN	250	10.00		89	68	75	50	9	09	28.72	29.83
				SUNRISE: 0530 JUL 16 SUNSET: 1938								
02	BKN	250	10.00		86	65	72	49	9	11	28.70	29.81
05	SCT	250	10.00		84	66	72	55	7	10	28.70	29.82
08	SCT	250	10.00		89	65	73	45	3	11	28.74	29.85
11	SCT	250	10.00		96	54	69	24	0	00	28.72	29.84
14	SCT	250	10.00		104	51	70	17	13	26	28.65	29.75
17	BKN	250	10.00		104	49	70	16	10	28	28.60	29.70
20	BKN	250	10.00		99	58	72	26	6	23	28.58	29.68
23	FEW	250	10.00		95	59	71	30	8	09	28.62	29.72
				SUNRISE: 0530 JUL 17 SUNSET: 1938								
02	SCT	250	10.00		91	49	66	24	0	00	28.62	29.72
05	BKN	170	10.00		89	61	71	39	5	06	28.64	29.75
08	BKN	170	10.00		89	54	67	30	9	06	28.69	29.80
11	BKN	170	10.00		93	44	64	18	6	31	28.71	29.83
14	FEW	170	10.00		103	35	65	9	7	26	28.66	29.77
17	FEW	250	10.00		104	33	65	8	13	28	28.61	29.71
20	SCT	250	10.00		101	33	64	9	13	28	28.60	29.70
23	FEW	200	10.00		96	43	65	16	9	26	28.65	29.75
				SUNRISE: 0531 JUL 18 SUNSET: 1937								
02	CLR	NC	10.00		90	44	63	20	3	35	28.66	29.78
05	SCT	230	10.00		85	46	62	26	8	07	28.70	29.82
08	SCT	250	10.00		87	45	63	23	7	12	28.74	29.86
11	SCT	250	10.00		96	40	64	14	0	00	28.75	29.86
14	SCT	200	10.00		103	39	66	11	7	VR	28.69	29.80
17	BKN	200	10.00		103	41	66	12	0	00	28.63	29.74
20	BKN	250	10.00		102	37	65	10	13	29	28.63	29.73
23	SCT	250	10.00		95	40	64	15	10	29	28.66	29.78

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0532 JUL 19 SUNSET: 1937								
02	SCT	250	10.00		92	41	63	17	5	33	28.69	29.79
05	BKN	110	10.00	-RA	90	47	64	23	5	02	28.69	29.80
08	OVC	250	10.00		91	46	64	21	6	21	28.75	29.86
11	BKN	250	10.00		97	42	65	15	11	31	28.76	29.87
14	BKN	200	10.00		101	45	67	15	0	00	28.70	29.81
17	SCT	210	10.00		102	47	68	15	7	28	28.64	29.74
20	FEW	120	10.00		101	49	69	17	7	31	28.65	29.75
23	CLR	NC	10.00		97	46	66	17	10	27	28.68	29.79
				SUNRISE: 0532 JUL 20 SUNSET: 1937								
02	FEW	230	10.00		91	40	62	17	7	32	28.69	29.79
05	BKN	230	10.00		85	36	59	17	3	23	28.72	29.83
08	BKN	250	10.00		89	40	62	18	5	11	28.77	29.88
11	BKN	250	10.00		96	37	63	13	7	15	28.77	29.89
14	BKN	250	10.00		103	33	64	9	7	22	28.72	29.83
17	FEW	250	10.00		106	36	66	9	10	26	28.66	29.76
20	FEW	250	10.00		102	38	65	11	6	35	28.66	29.76
23	CLR	NC	10.00		96	40	64	14	8	25	28.70	29.81
				SUNRISE: 0533 JUL 21 SUNSET: 1936								
02	FEW	250	10.00		94	36	62	13	8	30	28.72	29.83
05	BKN	230	10.00		85	44	62	24	3	20	28.75	29.86
08	BKN	250	10.00		91	41	63	17	0	00	28.81	29.93
11	FEW	250	10.00		98	37	64	12	7	32	28.81	29.92
14	FEW	220	10.00		103	37	65	10	8	23	28.75	29.86
17	FEW	250	10.00		106	40	67	10	14	29	28.69	29.80
20	CLR	NC	10.00		103	44	67	13	9	26	28.69	29.79
23	CLR	NC	10.00		99	47	67	17	7	29	28.71	29.82
				SUNRISE: 0534 JUL 22 SUNSET: 1935								
02	CLR	NC	10.00		91	51	66	26	3	23	28.70	29.81
05	FEW	230	10.00		91	50	66	25	9	29	28.72	29.83
08	BKN	250	10.00		91	51	66	26	5	09	28.77	29.88
11	BKN	250	10.00		100	47	68	16	3	VR	28.76	29.87
14	BKN	250	10.00		108	46	70	12	10	28	28.69	29.80
17	SCT	250	10.00		112	44	70	10	14	30	28.64	29.73
20	FEW	250	10.00		108	45	69	12	8	26	28.64	29.74
23	FEW	210	10.00		102	48	69	16	5	26	28.69	29.78
				SUNRISE: 0534 JUL 23 SUNSET: 1935								
02	BKN	210	10.00		99	48	68	18	5	07	28.69	29.79
05	BKN	250	10.00		95	52	68	23	3	05	28.69	29.79
08	BKN	230	10.00		99	58	72	26	9	12	28.74	29.84
11	BKN	220	10.00		108	56	73	18	13	16	28.72	29.83
14	BKN	250	10.00		111	54	73	15	9	10	28.66	29.77
17	BKN	250	10.00		113	50	72	12	0	00	28.59	29.69
20	BKN	250	10.00		107	56	73	19	14	12	28.61	29.70
23	BKN	250	10.00		101	59	73	25	3	VR	28.69	29.79
				SUNRISE: 0535 JUL 24 SUNSET: 1934								
02	OVC	250	10.00		96	62	73	32	16	05	28.66	29.77
05	BKN	250	10.00		95	62	73	34	8	08	28.66	29.76
08	BKN	220	10.00		99	61	73	29	9	09	28.69	29.79
11	SCT	230	10.00		108	53	72	16	10	14	28.66	29.76
14	SCT	250	10.00		114	46	71	10	10	17	28.60	29.70
17	SCT	250	10.00		114	42	70	9	9	13	28.52	29.62
20	SCT	250	10.00		109	40	68	9	3	16	28.54	29.64
23	BKN	250	10.00		100	57	72	24	14	25	28.60	29.70

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2014 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0536		JUL 25			SUNSET: 1934						
02	BKN	250	10.00		96	61	73	31	9	28	28.66	29.76
05	SCT	250	10.00		92	62	72	37	6	08	28.69	29.78
08	FEW	250	10.00		93	65	74	40	9	12	28.73	29.84
11	FEW	085	10.00		102	63	75	28	8	20	28.71	29.82
14	FEW	250	10.00		106	60	75	22	3	VR	28.65	29.75
17	SCT	200	10.00		107	58	74	20	13	24	28.59	29.69
20	SCT	130	10.00		91	60	71	35	14	18	28.68	29.79
23	BKN	200	10.00		89	65	73	45	7	12	28.72	29.83
	SUNRISE: 0536		JUL 26			SUNSET: 1933						
02	BKN	250	10.00		88	63	71	43	6	16	28.71	29.83
05	BKN	250	10.00		84	63	70	49	10	13	28.73	29.85
08	FEW	150	10.00		88	64	72	45	6	11	28.78	29.90
11	CLR	NC	10.00		95	62	73	34	8	28	28.77	29.88
14	SCT	120	10.00		103	59	73	24	6	VR	28.69	29.80
17	FEW	120	10.00		107	57	74	19	16	27	28.61	29.71
20	SCT	270	10.00		103	57	73	22	10	24	28.60	29.70
23	BKN	170	4.00		95	60	72	31	21	13	28.69	29.80
	SUNRISE: 0537		JUL 27			SUNSET: 1932						
02	OVC	270	10.00		88	67	74	50	7	06	28.72	29.83
05	OVC	270	10.00		85	63	71	48	15	20	28.80	29.92
08	BKN	190	10.00		83	62	69	49	14	10	28.88	30.00
11	BKN	190	10.00		91	60	71	35	6	31	28.80	29.91
14	BKN	250	10.00		101	59	73	25	10	27	28.72	29.84
17	SCT	250	10.00		102	54	71	20	11	27	28.68	29.78
20	BKN	250	10.00		99	55	71	23	10	26	28.71	29.83
23	BKN	250	10.00		95	57	70	28	0	00	28.77	29.88
	SUNRISE: 0538		JUL 28			SUNSET: 1932						
02	OVC	250	10.00		87	61	70	42	11	14	28.79	29.91
05	OVC	250	10.00		86	61	70	43	6	13	28.81	29.93
08	BKN	250	10.00		88	61	70	40	8	11	28.86	29.98
11	SCT	220	10.00		98	58	72	26	9	17	28.86	29.98
14	SCT	220	10.00		102	55	71	21	5	VR	28.79	29.90
17	SCT	250	10.00		105	55	72	19	0	00	28.71	29.82
20	SCT	250	10.00		103	57	73	22	13	30	28.70	29.81
23	FEW	250	10.00		99	56	71	24	7	26	28.75	29.86
	SUNRISE: 0538		JUL 29			SUNSET: 1931						
02	FEW	250	10.00		96	58	71	28	5	31	28.74	29.85
05	FEW	250	10.00		93	58	70	31	8	28	28.76	29.87
08	FEW	250	10.00		94	59	71	31	6	36	28.79	29.90
11	SCT	250	10.00		101	58	73	24	6	28	28.77	29.88
14	BKN	250	10.00		107	57	74	19	15	21	28.70	29.81
17	SCT	250	10.00		108	53	72	16	13	26	28.65	29.75
20	BKN	290	10.00		105	50	70	16	11	26	28.63	29.73
23	FEW	250	10.00		100	53	70	21	5	25	28.66	29.77
	SUNRISE: 0539		JUL 30			SUNSET: 1930						
02	CLR	NC	10.00		97	53	69	23	7	26	28.66	29.76
05	FEW	250	10.00		93	55	69	28	6	34	28.66	29.78
08	FEW	250	10.00		95	56	70	27	3	VR	28.70	29.81
11	SCT	250	10.00		104	54	72	19	3	VR	28.71	29.82
14	SCT	250	10.00		108	51	71	15	0	00	28.66	29.75
17	SCT	290	10.00		109	47	70	12	9	28	28.60	29.70
20	BKN	290	10.00		106	50	70	15	8	23	28.60	29.70
23	FEW	250	10.00		102	50	69	17	7	25	28.63	29.73

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0540		JUL 31			SUNSET: 1929						
02	FEW	250	10.00		95	57	70	28	8	09	28.65	29.75
05	FEW	250	10.00		92	57	70	31	8	11	28.68	29.78
08	BKN	250	10.00		92	58	70	32	9	13	28.72	29.83
11	BKN	250	10.00		102	52	70	19	6	25	28.74	29.85
14	BKN	200	10.00		107	54	72	17	8	14	28.69	29.79
17	BKN	200	10.00		106	52	71	17	0	00	28.61	29.71
20	BKN	250	10.00		103	54	71	20	16	32	28.63	29.73
23	BKN	180	10.00		96	54	69	24	18	32	28.69	29.80

3-HOURLY OBSERVATION NOTES

Sky Cover is the amount of the sky obscured. CLR or SKC = 0, FEW = 1/8-2/8, SCT = 3/8-4/8, BKN = 5/8-7/8, OVC = 8/8, W = Vertical Visibility = 8/8

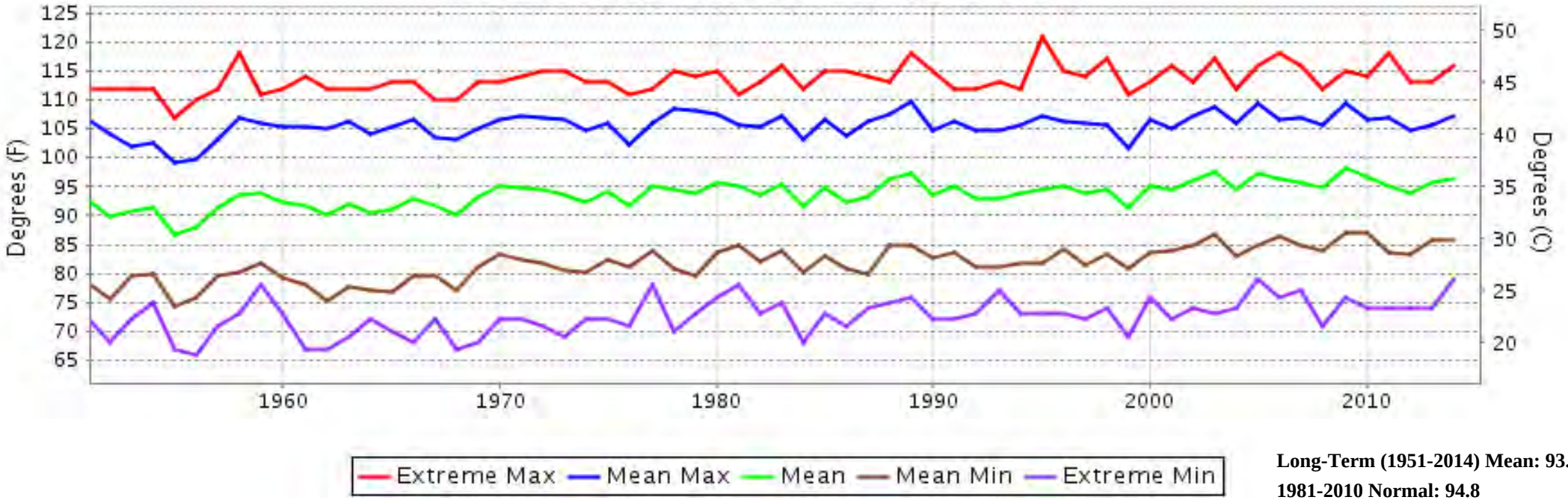
Ceiling is reported in hundreds of feet above ground level for clouds at or below 12,000 feet. NC = No Ceiling detected.

& = Original observation containted additional weather elements.
See page 3 for additional notes.

SUMMARY BY HOUR

HOUR (LST)	AVERAGES DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY	PRESSURE (Inches, HG) STATION	SEA LEVEL	VISIBILITY (Miles)	WIND SPEED (MPH)	RESULTANT WIND (MPH) SPEED	DIRECTION
01	92	56	69	33	28.69	29.80	10.00	8	2	23
02	91	56	69	34	28.69	29.80	10.00	7	1	18
03	90	57	69	36	28.70	29.80	9.97	6	1	15
04	89	57	69	37	28.70	29.81	10.00	6	1	14
05	88	58	69	37	28.71	29.82	10.00	6	2	12
06	87	58	69	38	28.73	29.84	10.00	6	3	11
07	88	58	69	37	28.74	29.85	10.00	5	4	11
08	90	57	70	35	28.76	29.87	10.00	6	5	10
09	93	56	70	31	28.76	29.87	10.00	5	4	11
10	95	55	70	28	28.76	29.87	10.00	5	2	13
11	98	54	70	25	28.75	29.86	10.00	5	2	22
12	100	53	70	22	28.73	29.84	10.00	4	3	18
13	102	53	71	20	28.71	29.82	10.00	7	4	25
14	104	52	71	19	28.68	29.79	10.00	7	4	25
15	105	51	71	18	28.66	29.76	10.00	9	6	26
16	105	51	71	17	28.63	29.74	10.00	9	7	26
17	105	50	71	17	28.62	29.73	9.94	10	6	26
18	104	51	71	19	28.62	29.72	9.73	11	8	26
19	102	52	71	21	28.62	29.73	9.81	11	6	26
20	100	53	70	22	28.64	29.74	9.71	11	5	26
21	98	54	70	25	28.66	29.76	10.00	10	2	24
22	96	55	70	27	28.68	29.79	10.00	8	2	24
23	95	56	70	29	28.69	29.80	9.61	9	2	24
24	93	56	70	32	28.70	29.81	10.00	9	2	24

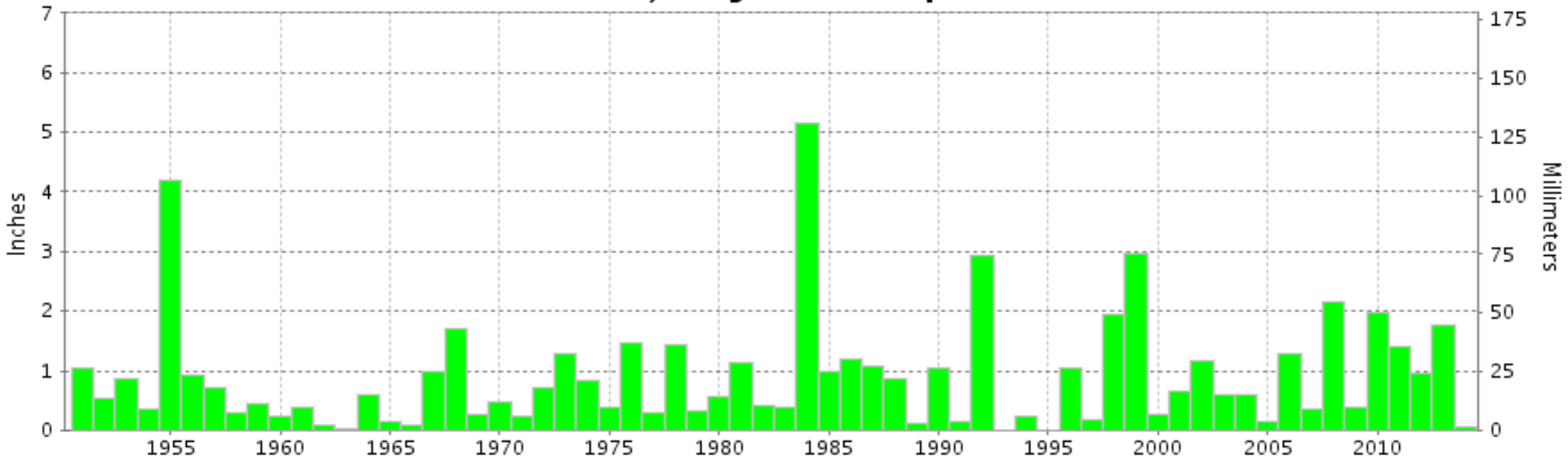
PHOENIX, AZ JULY Temperatures



Long-Term (1951-2014) Mean: 93.7

1981-2010 Normal: 94.8

PHOENIX, AZ JULY Precipitation



Long-Term (1951-2014) Mean Monthly Total: 0.90 **1981-2010 Normal: 1.05**

Published By: National Climatic Data Center

JULY 2014
PHOENIX, AZ

LOCAL CLIMATOLOGICAL DATA

NOAA, National Climatic Data Center

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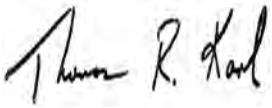

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Asheville, NC 28801-5001

JULY 2013
LOCAL CLIMATOLOGICAL DATA
NOAA, National Climatic Data Center

PHOENIX, AZ
PHOENIX SKY HARBOR INTL AIRPORT (KPHX)
Lat:33° 25'N Long: 112° 0'W Elev (Ground) 1107 Feet
Time Zone : MOUNTAIN WBAN: 23183 ISSN#: 0198-0475

Date	Temperature °F						Deg Days BASE 65°		WEATHER	SNOW/ICE ON GND(IN)		PRECIPITATION ON GND(IN)		PRESSURE (INCHES OF HG)		WIND SPEED = MPH DIR = TENS OF DEGREES							Date
										0500 LST	1100 LST	2400 LST	2400 LST						MAXIMUM 3-SEC		MAXIMUM 2-MIN		
	MAXIMUM	MINIMUM	AVERAGE	DEP FROM NORMAL	AVERAGE DEW PT	AVERAGE WET BULB	HEATING	COOLING		DEPTH	WATER-EQUIV	SNOW-FALL	WATER EQUIV	AVERAGE STATION	AVERAGE SEA LEVEL	RESULTANT SPEED	RES DIR	AVERAGE SPEED	SPEED	DIR	SPEED	DIR	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
01	112	90	101	9	53	71	0	36				0.0	0.00	28.60	29.71	2.6	26	8.1	33	21	24	20	01
02	108	85	97	5	56	71	0	32	RA			0.0	T	28.67	29.78	4.8	17	11.3	43*	16	32	17	02
03	111	87	99	7	51	69	0	34				0.0	0.00	28.55	29.68	2.4	16	9.9	26	15	22	29	03
04	108	91	100	8	54	70	0	35				0.0	0.00	28.53	29.63	5.3	28	9.2	25	24	18	28	04
05	106	89	98	6	57	71	0	33				0.0	0.00	28.56	29.67	0.6	27	7.4	19	32	15	32	05
06	111	88	100	7	58	72	0	35				0.0	0.00	28.52	29.63	1.1	32	7.0	25	31	21	27	06
07	112	90	101	8	56	72	0	36				0.0	0.00	28.52	29.63	1.8	17	5.6	19	12	16	27	07
08	113*	91	102	9	54	71	0	37				0.0	0.00	28.61	29.72	3.0	14	8.6	24	15	18	14	08
09	107	90	99	6	61	73	0	34				0.0	0.00	28.71	29.83	10.7	28	12.4	27	27	22	26	09
10	104	86	95	2	62	73	0	30				0.0	0.00	28.69	29.81	9.7	28	11.5	28	31	22	32	10
11	97	82	90	-3	65	73	0	25	RA			0.0	T	28.68	29.81	5.8	29	8.0	21	26	18	27	11
12	101	87	94	1	62	72	0	29				0.0	0.00	28.66	29.78	1.1	19	8.5	26	12	21	12	12
13	106	84	95	2	60	72	0	30				0.0	0.00	28.64	29.76	1.0	26	5.9	19	28	16	28	13
14	110	93	102*	9	59	72	0	37	RA			0.0	T	28.61	29.72	5.1	28	7.8	33	28	29	28	14
15	110	92	101	8	61	73	0	36	TS RA			0.0	T	28.55	29.66	2.3	26	5.6	33	11	26	13	15
16	104	83	94	1	65	73	0	29	TS			0.0	0.00	28.69	29.80	12.2	11	13.6	40	06	33	06	16
17	107	84	96	3	61	72	0	31				0.0	0.00	28.72	29.85	3.8	07	7.2	27	35	21	34	17
18	108	88	98	5	56	70	0	33				0.0	0.00	28.66	29.79	5.8	11	9.3	30	14	22	14	18
19	105	81	93	0	63	73	0	28	TS TSRA RA			0.0	0.03	28.64	29.76	1.9	13	7.8	30	08	24	36	19
20	103	77	90	-3	67	74	0	25	TS RA			0.0	0.06	28.61	29.74	3.3	29	9.2	41	07	35*	07	20
21	87	74*	81*	-12	72	75	0	16	RA FG+ BR			0.0	0.89	28.68	29.80	1.0	07	6.4	29	29	21	23	21
22	96	79	88	-5	69	75	0	23				0.0	0.00	28.71	29.84	2.0	21	5.3	30	24	26	23	22
23	102	82	92	-1	64	73	0	27				0.0	0.00	28.69	29.81	3.9	27	7.4	21	29	16	26	23
24	107	88	98	5	62	73	0	33	RA			0.0	0.04	28.63	29.74	4.8	27	7.6	23	27	16	22	24
25	101	76	89	-4	68	75	0	24	TS TSRA RA			0.0	0.75	28.72	29.84	4.8	13	6.9	25	17	20	17	25
26	103	87	95	2	68	76	0	30	RA			0.0	T	28.78	29.90	2.6	14	6.2	25	16	20	16	26
27	105	84	95	2	65	74	0	30				0.0	0.00	28.67	29.80	2.9	10	5.9	23	10	20	10	27
28	108	87	98	5	56	71	0	33				0.0	0.00	28.58	29.69	2.2	25	8.3	28	28	21	28	28
29	107	85	96	3	47	67	0	31				0.0	0.00	28.69	29.80	1.4	21	7.9	20	15	16	17	29
30	108	86	97	4	49	68	0	32				0.0	0.00	28.78	29.90	5.4	27	6.5	19	30	15	30	30
31	109	91	100	7	51	69	0	35				0.0	0.00	28.72	29.84	2.2	31	7.4	25	06	21	07	31
	105.7	85.7	95.7	¤	59.7	72.0	0.0	30.9	< MONTHLY AVERAGES | TOTALS >			0.0	1.77	28.65	29.77	1.1	24	8.1	< MONTHLY AVERAGES				
	-0.4	2.2	0.9		<---------- DEPARTURE FROM NORMAL ---------->								0.72	SUNSHINE, CLOUD, & VISIBILITY TABLES ON PAGE 3									

JULY 2013
PHOENIX, AZ

DEGREE DAYS

	MONTHLY TOTAL	MONTHLY DEPARTURE	SEASON TO DATE TOTAL	SEASON TO DATE DEPARTURE
HEATING :	0	0	0	0
COOLING :	959	35	2959	375

GREATEST 24-HR PRECIPITATION : 0.95 DATE : 20-21
GREATEST 24-HR SNOWFALL : 0.0 DATE :
GREATEST SNOW DEPTH : DATE :

SEA LEVEL PRESSURE		DATE	TIME
MAXIMUM :	29.98	30	1020
MIMIMUM :	29.53	06	1724

NUMBER OF -> DAYS WITH

MAXIMUM TEMP >= 90 :	30	MINIMUM TEMP <= 32 :	0
MAXIMUM TEMP <= 32 :	0	MINIMUM TEMP <= 0 :	0
THUNDERSTORMS :	5	HEAVY FOG :	1
PRECIPITATION >= 0.01 INCH:	5		
PRECIPITATION >= 0.10 INCH:	2		
SNOWFALL >= 1.0 INCH :			

HOURLY PRECIPITATION
(WATER EQUIVALENT IN INCHES)

PHOENIX, AZ (KPHX)
JULY 2013

WBAN # 23183

Date	FOR HOUR (LST) ENDING AT												Date	FOR HOUR (LST) ENDING AT												Date	Sum of Hourly Data	2400 LST Water Equiv.
	1	2	3	4	5	6	7	8	9	10	11	12		13	14	15	16	17	18	19	20	21	22	23	24			
01													01													01	0.00	0.00
02							T						02													02	T	T
03													03													03	0.00	0.00
04													04													04	0.00	0.00
05													05													05	0.00	0.00
06													06													06	0.00	0.00
07													07													07	0.00	0.00
08													08													08	0.00	0.00
09													09													09	0.00	0.00
10													10													10	0.00	0.00
11			T										11													11	T	T
12													12													12	0.00	0.00
13													13													13	0.00	0.00
14													14	T												14	T	T
15													15						T	T						15	T	T
16													16													16	0.00	0.00
17													17													17	0.00	0.00
18													18													18	0.00	0.00
19	0.01	0.01	0.01										19													19	0.03	0.03
20													20									0.02	T	0.01	0.03	20	0.06	0.06
21	T									T	0.88		21			0.01	T								21	0.89	0.89
22													22													22	0.00	0.00
23													23													23	0.00	0.00
24													24								0.04			T		24	0.04	0.04
25						T	0.61	0.14					25													25	0.75	0.75
26									T	T			26													26	T	T
27													27													27	0.00	0.00
28													28													28	0.00	0.00
29													29													29	0.00	0.00
30													30													30	0.00	0.00
31													31													31	0.00	0.00

*** Indicates sum of Hourly and Daily disagree.**

MAXIMUM SHORT DURATION PRECIPITATION (See Note)

Time Period (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
Precipitation (Inches)	0.39	0.64	0.81	0.84	0.85	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Ending Date	21	21	21	21	21	21	21	21	21	21	21	21
Ending Time (Hr/Min)	1019	1022	1024	1024	1036	1044	1044	1044	1044	1044	1044	1044

Date and time are not entered for TRACE amounts.

Note : The hourly and daily precipitation totals are printed in the last 2 columns and hi-lighted in red when they disagree. NWS does not edit ASOS hourly values but may edit daily and monthly totals. Hourly, daily, and monthly totals are printed as reported by the ASOS site.

REFERENCE NOTES & SUPPLEMENTAL SUMMARIES

*** = Extreme for the month (last occurence if more than one).**

T = Trace precipitation amount.

+ = also occurs on earlier date.

FG+ = Heavy fog, visibility .25 miles or less.

BLANK entries denote missing or unreported data.

Resultant wind is the vector sum of the wind speeds and directions divided by the number of observations.

Wind direction is recorded in tens of degrees (2 digits) clockwise from true north. '00' = calm, 'VR' = variable.

Precipitation is for the 24-hour period ending at the time indicated in the column heading.

Ceilometer (30-second) data are used to derive cloudiness at or below 12,000 feet. This cloudiness is the mean cloud cover detected during sunrise to sunset (SR-SS), or midnight to midnight (MN-MN).

WEATHER NOTATIONS

QUALIFIER	WEATHER PHENOMENA		
DESCRIPTOR	PRECIPITATION	OBSCURATION	OTHER
BC Patches	DZ Drizzle	BR Mist	DS Duststorm
BL Blowing	GR Hail	DU Widespread Dust	FC Funnel Cloud
DR Low Drifting	GS Small Hail and/or Snow Pellets	FG Fog	+FC Tornado Waterspout
FZ Freezing	IC Ice Crystals	FU Smoke	PO Well-Developed Dust/Sand Whirls
MI Shallow	PL Ice Pellets	HZ Haze	
PR Partial	RA Rain	PY Spray	SQ Squalls
SH Shower(s)	SG Snow Grains	SA Sand	SS Sandstorm
TS Thunderstorm	SN Snow	VA Volcanic Ash	GL Glaze
VC In the Vicinity	UP Unkown Precipitation		

Intensity (as indicated on pages 4 to 6):
'+' = Heavy ' ' = Moderate '-' = Light

PHOENIX, AZ
JULY 2013

Sky Condition is based on the sum (not to exceed 8) of the sunrise to sunset cloud cover below and above 12,000 feet.

Clear = 0-2 oktas, Partly Cloudy = 3-6 oktas, Cloudy = 7-8 oktas.

A Heating (Cooling) Degree Day is the difference between the average daily temperature and 65 degrees F. The HDD season begins July 1, the CDD season begins January 1.

Snow Depth, Snowfall, and Sunshine data may come from nearby sites that the National Weather Service deems Climatologically representative of this site.

NORMALS ARE FOR THE YEARS 1981-2010

ADDITIONAL NOTES & ERRATA:

```
Station Augmentation-CONTRACTOR
  Lat/Lon:33.44417/-112.02472 Elevation:1107FT
  Distance:.5 MI Dir:N
  Augmented Elements:Temp, Precip
  Equipment:MXMN, SRG

Beginning with the January 2013 LCD, monthly mean temperature
calculations have changed to the National Data Stewardship
Team standard. Monthly maximum and minimum temperature are
not rounded until after monthly mean temperature is calculated.
This is the most accurate outcome, but may be slightly different
from the mean derived from rounded monthly maximum and minimum.
```

Date	VISIBILITY (MILES) MINIMUM	VISIBILITY (MILES) MAXIMUM
01	10.00	10.00
02	5.00	10.00
03	10.00	10.00
04	10.00	10.00
05	10.00	10.00
06	9.00	10.00
07	10.00	10.00
08	10.00	10.00
09	10.00	10.00
10	10.00	10.00
11	10.00	10.00
12	10.00	10.00
13	10.00	10.00
14	10.00	10.00
15	10.00	10.00
16	10.00	10.00
17	10.00	10.00
18	10.00	10.00
19	8.00	10.00
20	6.00	10.00
21	10.00	10.00
22	10.00	10.00
23	10.00	10.00
24	6.00	10.00
25	7.00	10.00
26	10.00	10.00
27	10.00	10.00
28	10.00	10.00
29	10.00	10.00
30	10.00	10.00
31	10.00	10.00
AVGS	9.39	10.00

MINIMUM VISIBILTY (MILES)

<= .25	<= 3.0	>= 7.0
0	0	28

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2013 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0522 JUL 01 SUNSET: 1942								
02	BKN	200	10.00		94	58	71	30	15	08	28.66	29.76
05	BKN	200	10.00		91	58	70	33	6	11	28.66	29.76
08	BKN	250	10.00		95	57	70	28	3	08	28.69	29.79
11	FEW	210	10.00		103	56	72	21	5	18	28.66	29.76
14	FEW	250	10.00		109	49	71	13	8	24	28.60	29.70
17	BKN	230	10.00		110	48	71	13	9	24	28.54	29.64
20	BKN	200	10.00		109	48	71	13	14	27	28.52	29.62
23	BKN	250	10.00		102	51	70	18	6	25	28.58	29.68
				SUNRISE: 0522 JUL 02 SUNSET: 1942								
02	SCT	250	10.00		100	52	70	20	10	27	28.60	29.70
05	SCT	200	9.00		91	59	70	34	24	16	28.72	29.83
08	BKN	250	10.00		89	63	72	42	10	11	28.80	29.91
11	BKN	250	10.00		96	60	72	30	3	VR	28.77	29.88
14	FEW	250	10.00		104	55	72	20	7	23	28.69	29.79
17	FEW	250	10.00		107	53	72	17	11	26	28.59	29.69
20	BKN	230	10.00		106	52	71	17	8	26	28.59	29.70
23	OVC	210	10.00		95	56	70	27	13	15	28.65	29.75
				SUNRISE: 0523 JUL 03 SUNSET: 1942								
02	BKN	210	10.00		90	55	68	31	15	12	28.64	29.75
05	FEW	210	10.00		88	54	67	31	7	12	28.63	29.74
08	SCT	250	10.00		90	55	68	31	10	10	28.69	29.79
11	SCT	250	10.00		100	53	70	21	10	16	28.66	29.76
14	SCT	250	10.00		106	51	71	16	3	VR	28.57	29.67
17	BKN	250	10.00		111	46	70	11	20	30	28.47	29.57
20	BKN	230	10.00		107	47	70	13	6	25	28.46	29.56
23	FEW	230	10.00		102	50	69	17	9	26	28.49	29.58
				SUNRISE: 0523 JUL 04 SUNSET: 1941								
02	FEW	200	10.00		97	52	69	22	6	29	28.50	29.60
05	BKN	190	10.00		92	54	68	28	6	10	28.53	29.63
08	SCT	210	10.00		94	54	69	26	6	06	28.61	29.71
11	SCT	190	10.00		101	52	70	19	9	31	28.61	29.71
14	FEW	210	10.00		104	55	72	20	10	27	28.54	29.64
17	FEW	210	10.00		107	53	72	17	16	29	28.47	29.57
20	SCT	250	10.00		104	54	71	19	10	25	28.48	29.57
23	FEW	250	10.00		99	57	71	25	14	26	28.53	29.62
				SUNRISE: 0524 JUL 05 SUNSET: 1941								
02	FEW	250	10.00		94	56	70	28	8	30	28.55	29.65
05	SCT	250	10.00		92	55	69	29	7	29	28.57	29.67
08	BKN	230	10.00		91	57	69	32	0	00	28.64	29.74
11	BKN	230	10.00		96	57	71	27	9	06	28.65	29.75
14	BKN	250	10.00		100	56	71	23	6	36	28.57	29.67
17	BKN	250	10.00		105	54	72	18	7	30	28.50	29.60
20	BKN	210	10.00		100	60	73	27	8	15	28.50	29.60
23	BKN	250	10.00		94	63	73	36	8	14	28.57	29.67
				SUNRISE: 0524 JUL 06 SUNSET: 1941								
02	BKN	250	10.00		92	62	72	37	7	09	28.56	29.66
05	SCT	200	10.00		89	62	71	41	6	09	28.56	29.66
08	SCT	200	10.00		91	64	73	41	6	10	28.60	29.71
11	SCT	250	10.00		101	59	73	25	5	10	28.58	29.68
14	FEW	250	10.00		107	58	74	20	3	22	28.50	29.60
17	FEW	250	10.00		108	53	72	16	14	28	28.44	29.53
20	SCT	250	10.00		106	51	71	16	9	30	28.46	29.56
23	SCT	250	10.00		100	56	71	23	3	11	28.52	29.62
				SUNRISE: 0525 JUL 07 SUNSET: 1941								
02	SCT	250	10.00		95	59	71	30	8	06	28.51	29.61
05	BKN	210	10.00		91	61	71	37	3	06	28.53	29.62
08	BKN	200	10.00		94	60	72	32	7	10	28.59	29.69
11	BKN	220	10.00		100	57	72	24	5	22	28.58	29.68
14	SCT	190	10.00		108	56	73	18	3	VR	28.52	29.61
17	SCT	190	10.00		111	51	72	14	10	26	28.46	29.55
20	BKN	200	10.00		108	48	70	13	9	26	28.49	29.59
23	SCT	250	10.00		101	55	71	22	9	15	28.55	29.65
				SUNRISE: 0525 JUL 08 SUNSET: 1941								
02	SCT	250	10.00		97	58	71	27	7	09	28.60	29.70
05	SCT	250	10.00		93	57	70	30	5	12	28.63	29.72
08	FEW	250	10.00		97	57	71	26	11	10	28.68	29.78
11	SCT	250	10.00		105	56	73	20	7	14	28.68	29.77
14	FEW	250	10.00		111	53	73	15	8	25	28.61	29.71
17	FEW	250	10.00		113	45	71	10	8	31	28.56	29.65
20	BKN	250	10.00		109	43	69	11	7	23	28.57	29.67
23	BKN	250	10.00		99	56	71	24	10	19	28.65	29.75
				SUNRISE: 0526 JUL 09 SUNSET: 1941								
02	BKN	250	10.00		96	59	72	29	6	08	28.69	29.79
05	BKN	250	10.00		93	60	71	33	11	29	28.73	29.84
08	BKN	250	10.00		92	63	73	38	16	27	28.82	29.93
11	BKN	250	10.00		96	66	75	37	17	28	28.81	29.92
14	BKN	250	10.00		102	61	74	26	14	28	28.75	29.86
17	BKN	250	10.00		106	58	74	21	17	27	28.66	29.75
20	BKN	250	10.00		99	64	75	32	16	26	28.63	29.73
23	OVC	250	10.00		96	63	74	34	10	27	28.68	29.78
				SUNRISE: 0526 JUL 10 SUNSET: 1940								
02	OVC	250	10.00		93	62	72	36	13	27	28.72	29.83
05	OVC	250	10.00		86	66	73	51	18	32	28.75	29.87
08	SCT	250	10.00		87	67	73	51	5	VR	28.78	29.89
11	SCT	220	10.00		94	62	73	35	6	VR	28.77	29.88
14	SCT	250	10.00		100	62	74	29	9	28	28.69	29.80
17	SCT	160	10.00		103	61	74	25	15	26	28.63	29.73
20	SCT	160	10.00		100	59	73	26	14	28	28.62	29.72
23	BKN	250	10.00		98	58	72	26	10	27	28.66	29.77
				SUNRISE: 0527 JUL 11 SUNSET: 1940								
02	BKN	250	10.00		91	63	72	39	10	28	28.69	29.80
05	OVC	250	10.00		88	66	73	48	11	32	28.70	29.81
08	BKN	170	10.00		82	69	73	65	13	31	28.77	29.89
11	BKN	200	10.00		88	67	74	50	6	32	28.76	29.88
14	BKN	250	10.00		96	66	75	37	10	27	28.70	29.82
17	BKN	190	10.00		97	63	74	33	10	25	28.64	29.75
20	BKN	270	10.00		94	63	73	36	8	32	28.64	29.75
23	BKN	250	10.00		93	61	72	34	5	25	28.65	29.76
				SUNRISE: 0527 JUL 12 SUNSET: 1940								
02	BKN	250	10.00		90	59	70	35	9	26	28.66	29.77
05	BKN	250	10.00		87	61	70	42	8	26	28.68	29.78
08	SCT	200	10.00		90	62	71	39	7	32	28.70	29.81
11	BKN	250	10.00		97	61	73	30	8	21	28.70	29.81
14	BKN	200	10.00		96	61	73	31	7	27	28.68	29.79
17	BKN	250	10.00		93	65	74	40	11	13	28.64	29.75
20	SCT	250	10.00		92	65	74	41	8	11	28.63	29.74
23	BKN	250	10.00		89	64	72	43	9	09	28.66	29.78

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2013 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0528 JUL 13 SUNSET: 1940								
02	BKN	250	10.00		86	63	71	46	5	09	28.66	29.78
05	SCT	250	10.00		84	63	70	49	5	10	28.69	29.80
08	SCT	210	10.00		89	63	72	42	7	08	28.73	29.85
11	BKN	210	10.00		95	62	73	34	0	00	28.71	29.83
14	BKN	210	10.00		103	60	74	24	5	18	28.65	29.75
17	SCT	210	10.00		104	58	73	22	5	01	28.59	29.69
20	BKN	210	10.00		102	56	72	22	7	25	28.59	29.70
23	BKN	250	10.00		100	56	71	23	10	28	28.62	29.72
				SUNRISE: 0528 JUL 14 SUNSET: 1939								
02	BKN	250	10.00		95	58	71	29	3	22	28.62	29.72
05	BKN	250	10.00		93	60	71	33	5	34	28.65	29.75
08	BKN	250	10.00		93	62	72	36	8	11	28.69	29.80
11	BKN	250	10.00		101	58	72	24	7	VR	28.68	29.78
14	BKN	250	10.00		106	57	73	20	7	22	28.60	29.70
17	BKN	250	10.00		108	56	73	18	9	31	28.53	29.63
20	BKN	250	10.00		103	57	73	22	15	31	28.54	29.64
23	BKN	170	10.00		94	61	72	33	11	24	28.59	29.70
				SUNRISE: 0529 JUL 15 SUNSET: 1939								
02	SCT	250	10.00		93	62	72	36	0	00	28.59	29.69
05	SCT	250	10.00		92	62	72	37	3	27	28.59	29.68
08	BKN	250	10.00		94	62	73	35	8	31	28.62	29.72
11	SCT	190	10.00		100	60	73	27	6	27	28.61	29.71
14	SCT	250	10.00		106	56	73	19	0	00	28.54	29.63
17	SCT	100	10.00		107	57	74	19	9	33	28.47	29.57
20	BKN	150	10.00		95	67	75	40	6	12	28.51	29.61
23	SCT	150	10.00		95	60	72	31	6	24	28.57	29.67
				SUNRISE: 0530 JUL 16 SUNSET: 1938								
02	BKN	150	10.00		86	65	72	49	18	13	28.63	29.73
05	BKN	180	10.00		85	66	72	53	14	11	28.65	29.75
08	SCT	170	10.00		86	66	73	51	14	13	28.71	29.82
11	BKN	250	10.00		95	64	74	36	9	11	28.71	29.82
14	BKN	170	10.00		98	62	74	31	3	18	28.68	29.78
17	BKN	170	10.00		98	63	74	32	14	11	28.64	29.75
20	BKN	140	10.00		86	66	73	51	14	10	28.70	29.82
23	BKN	140	10.00		86	67	73	53	17	09	28.77	29.89
				SUNRISE: 0530 JUL 17 SUNSET: 1938								
02	BKN	140	10.00		84	68	73	59	8	08	28.75	29.87
05	BKN	170	10.00		84	66	72	55	9	08	28.75	29.87
08	BKN	190	10.00		88	66	73	48	8	10	28.81	29.93
11	SCT	190	10.00		95	60	72	31	0	00	28.79	29.91
14	SCT	250	10.00		103	55	72	20	7	12	28.72	29.84
17	BKN	250	10.00		104	52	71	18	7	VR	28.66	29.78
20	BKN	200	10.00		96	61	73	31	6	28	28.69	29.79
23	SCT	250	10.00		95	61	72	32	3	07	28.71	29.82
				SUNRISE: 0531 JUL 18 SUNSET: 1937								
02	SCT	250	10.00		91	56	69	31	8	12	28.72	29.83
05	BKN	250	10.00		89	56	68	33	7	07	28.72	29.83
08	BKN	250	10.00		91	58	70	33	11	07	28.76	29.88
11	SCT	250	10.00		99	55	71	23	11	10	28.73	29.84
14	SCT	250	10.00		105	54	72	18	7	VR	28.66	29.77
17	SCT	250	10.00		105	53	71	18	7	24	28.58	29.68
20	SCT	250	10.00		102	58	73	23	10	34	28.61	29.71
23	SCT	250	10.00		97	56	70	25	15	14	28.65	29.75

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	TEMPERATURE °F DEW POINT	TEMPERATURE °F WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	PRESSURE (INCHES, HG) SEA LEVEL
				SUNRISE: 0532 JUL 19 SUNSET: 1937								
02	OVC	170	10.00	-RA	81	69	73	67	11	15	28.69	29.80
05	BKN	190	10.00		84	66	72	55	5	04	28.68	29.79
08	BKN	180	10.00		87	65	72	48	8	07	28.72	29.83
11	BKN	200	10.00		97	61	73	30	7	17	28.70	29.82
14	BKN	250	10.00		102	60	74	25	6	16	28.64	29.74
17	SCT	210	10.00		101	59	73	25	0	00	28.55	29.66
20	BKN	210	10.00		99	60	73	28	10	26	28.56	29.66
23	OVC	180	10.00	TS	85	66	72	53	22	01	28.68	29.78
				SUNRISE: 0532 JUL 20 SUNSET: 1937								
02	BKN	250	10.00		81	70	73	69	7	31	28.66	29.77
05	BKN	250	10.00		81	70	73	69	6	31	28.65	29.75
08	SCT	170	10.00		84	70	74	63	8	29	28.69	29.81
11	SCT	190	10.00		90	67	74	47	0	00	28.69	29.80
14	SCT	190	10.00		98	63	74	32	8	27	28.58	29.69
17	SCT	190	10.00		100	61	74	28	6	VR	28.52	29.62
20	SCT	140	10.00		96	64	74	35	11	30	28.56	29.67
23	OVC	130	10.00	-RA	79	73	75	82	17	08	28.65	29.76
				SUNRISE: 0533 JUL 21 SUNSET: 1936								
02	BKN	190	10.00		80	71	74	74	3	13	28.65	29.75
05	BKN	190	10.00		79	71	74	77	5	12	28.63	29.74
08	BKN	055	10.00		83	73	76	72	7	14	28.69	29.81
11	BKN	075	10.00		75	70	72	84	9	28	28.73	29.87
14	BKN	100	10.00		84	71	75	65	8	02	28.72	29.85
17	SCT	110	10.00		82	72	75	72	10	05	28.68	29.80
20	SCT	140	10.00		83	72	75	70	3	13	28.66	29.79
23	BKN	250	10.00		82	73	76	74	3	11	28.71	29.84
				SUNRISE: 0534 JUL 22 SUNSET: 1935								
02	SCT	250	10.00		81	72	75	74	0	00	28.71	29.83
05	SCT	250	10.00		79	72	74	79	8	09	28.71	29.84
08	FEW	250	10.00		83	72	75	70	6	08	28.76	29.89
11	SCT	250	10.00		90	69	75	50	6	25	28.77	29.89
14	BKN	220	10.00		90	69	75	50	17	23	28.72	29.84
17	SCT	130	10.00		93	62	72	36	8	30	28.69	29.80
20	SCT	190	10.00		92	66	74	43	0	00	28.66	29.78
23	FEW	180	10.00		88	67	74	50	5	14	28.71	29.83
				SUNRISE: 0534 JUL 23 SUNSET: 1935								
02	SCT	250	10.00		84	70	74	63	7	10	28.71	29.83
05	SCT	250	10.00		82	71	74	69	0	00	28.72	29.83
08	FEW	250	10.00		86	70	75	59	3	VR	28.76	29.88
11	FEW	250	10.00		95	62	73	34	8	28	28.76	29.87
14	FEW	250	10.00		99	61	73	29	13	29	28.69	29.80
17	FEW	250	10.00		101	60	73	26	9	26	28.63	29.74
20	FEW	250	10.00		99	57	71	25	8	26	28.63	29.74
23	FEW	250	10.00		94	60	72	32	5	25	28.66	29.78
				SUNRISE: 0535 JUL 24 SUNSET: 1934								
02	FEW	110	10.00		93	59	71	32	9	28	28.66	29.77
05	FEW	110	10.00		88	62	71	42	0	00	28.66	29.78
08	FEW	250	10.00		91	62	72	38	8	30	28.69	29.80
11	SCT	160	10.00		98	62	74	31	6	20	28.69	29.79
14	SCT	250	10.00		103	60	74	24	9	21	28.63	29.73
17	SCT	250	10.00		105	58	74	21	8	32	28.57	29.67
20	BKN	100	6.00	-RA	93	66	74	41	8	29	28.59	29.70
23	BKN	170	10.00		93	65	74	40	7	13	28.64	29.74

OBSERVATIONS AT 3-HOURLY INTERVALS

PHOENIX, AZ

JULY 2013 **KPHX** **WBAN # 23183**

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0536		JUL 25		SUNSET: 1934							
02	BKN	170	10.00		89	66	73	47	9	11	28.66	29.77
05	BKN	170	10.00		88	67	74	50	9	11	28.69	29.80
08	BKN	140	10.00		78	72	74	82	0	00	28.74	29.86
11	SCT	180	10.00		91	67	74	45	0	00	28.78	29.89
14	BKN	250	10.00		97	66	75	36	5	25	28.72	29.83
17	BKN	250	10.00		99	64	75	32	3	24	28.69	29.80
20	BKN	250	10.00		92	69	76	47	11	13	28.71	29.84
23	BKN	220	10.00		90	69	75	50	8	13	28.75	29.87
	SUNRISE: 0536		JUL 26		SUNSET: 1933							
02	OVC	220	10.00		89	70	76	53	6	13	28.76	29.88
05	BKN	160	10.00		87	72	76	61	6	15	28.79	29.91
08	BKN	150	10.00		88	72	77	59	8	13	28.85	29.97
11	SCT	150	10.00		94	70	77	46	6	32	28.85	29.97
14	SCT	210	10.00		100	66	76	33	0	00	28.78	29.89
17	BKN	250	10.00		102	61	74	26	6	25	28.73	29.84
20	SCT	210	10.00		100	63	75	30	7	28	28.72	29.83
23	BKN	250	10.00		92	65	74	41	10	14	28.77	29.88
	SUNRISE: 0537		JUL 27		SUNSET: 1932							
02	BKN	250	10.00		86	67	73	53	10	10	28.77	29.89
05	BKN	250	10.00		85	68	73	57	9	10	28.77	29.89
08	BKN	250	10.00		89	66	73	47	8	09	28.79	29.90
11	BKN	250	10.00		95	67	76	40	0	00	28.76	29.88
14	BKN	250	10.00		101	64	75	30	6	VR	28.68	29.78
17	BKN	250	10.00		102	62	75	27	7	34	28.60	29.70
20	BKN	250	10.00		101	62	74	28	6	01	28.57	29.67
23	BKN	250	10.00		97	66	75	36	0	00	28.61	29.71
	SUNRISE: 0538		JUL 28		SUNSET: 1932							
02	FEW	130	10.00		92	65	74	41	8	06	28.61	29.71
05	FEW	140	10.00		88	64	72	45	7	10	28.61	29.71
08	BKN	250	10.00		89	64	72	43	9	13	28.64	29.75
11	SCT	250	10.00		99	57	71	25	5	VR	28.64	29.75
14	FEW	250	10.00		105	51	71	16	3	VR	28.58	29.68
17	SCT	250	10.00		107	48	70	14	13	28	28.51	29.62
20	BKN	250	10.00		104	47	69	15	13	28	28.53	29.63
23	FEW	250	10.00		97	47	67	18	6	26	28.59	29.69
	SUNRISE: 0538		JUL 29		SUNSET: 1931							
02	FEW	200	10.00		93	50	67	23	7	02	28.63	29.73
05	FEW	150	10.00		87	53	66	31	7	09	28.66	29.77
08	FEW	250	10.00		89	52	66	28	11	12	28.72	29.83
11	FEW	250	10.00		99	41	65	14	3	VR	28.74	29.85
14	FEW	250	10.00		104	41	67	12	7	VR	28.71	29.82
17	FEW	250	10.00		105	43	68	12	8	24	28.66	29.78
20	FEW	250	10.00		103	45	68	14	11	28	28.68	29.78
23	CLR	NC	10.00		98	47	67	17	8	29	28.74	29.85
	SUNRISE: 0539		JUL 30		SUNSET: 1930							
02	CLR	NC	10.00		93	48	66	21	6	34	28.77	29.88
05	FEW	250	10.00		87	51	65	29	6	23	28.80	29.91
08	SCT	250	10.00		93	48	66	21	6	33	28.86	29.97
11	SCT	250	10.00		99	46	67	16	3	VR	28.86	29.97
14	FEW	250	10.00		106	51	71	16	10	25	28.80	29.91
17	FEW	250	10.00		106	49	70	15	8	25	28.73	29.84
20	SCT	250	10.00		104	48	69	15	11	28	28.73	29.84
23	FEW	250	10.00		98	51	69	20	9	25	28.76	29.87

HOUR (LST)	SKY COVER	CEILING 100's of FT.	VISIBILITY (MILES)	WEATHER	TEMPERATURE °F DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY (PCT)	WIND SPEED (MPH)	WIND DIRECTION Tens of Deg	PRESSURE (INCHES, HG) STATION	SEA LEVEL
	SUNRISE: 0540		JUL 31		SUNSET: 1929							
02	SCT	180	10.00		96	50	68	21	10	29	28.75	29.86
05	SCT	200	10.00		93	50	67	23	6	33	28.76	29.87
08	BKN	250	10.00		92	51	67	25	0	00	28.80	29.92
11	BKN	250	10.00		101	49	69	17	0	00	28.78	29.90
14	BKN	180	10.00		105	49	70	15	6	32	28.72	29.83
17	SCT	250	10.00		108	49	71	14	10	23	28.66	29.76
20	BKN	250	10.00		104	50	70	16	0	00	28.65	29.75
23	BKN	250	10.00		96	58	71	28	13	07	28.70	29.81

3-HOURLY OBSERVATION NOTES

Sky Cover is the amount of the sky obscured. CLR or SKC = 0, FEW = 1/8-2/8, SCT = 3/8-4/8, BKN = 5/8-7/8, OVC = 8/8, W = Vertical Visibility = 8/8

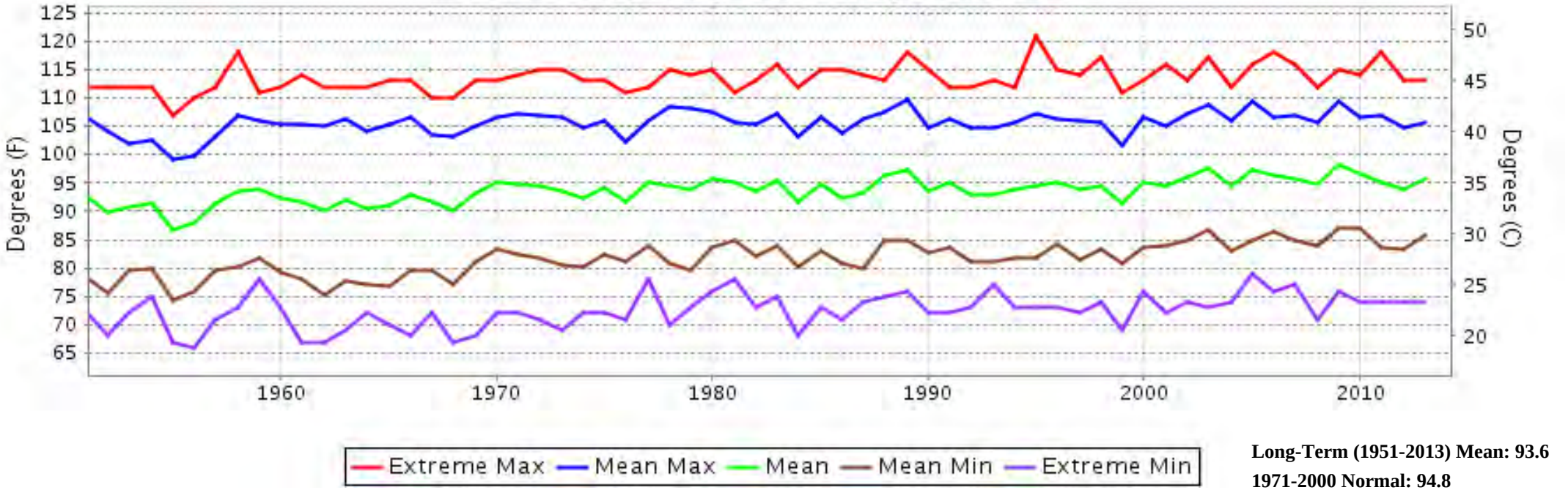
Ceiling is reported in hundreds of feet above ground level for clouds at or below 12,000 feet. NC = No Ceiling detected.

& = Original observation containted additional weather elements.
See page 3 for additional notes.

SUMMARY BY HOUR

HOUR (LST)	AVERAGES DRY BULB	DEW POINT	WET BULB	RELATIVE HUMIDITY	PRESSURE (Inches, HG) STATION	SEA LEVEL	VISIBILITY (Miles)	WIND SPEED (MPH)	RESULTANT WIND (MPH) SPEED	DIRECTION
01	92	61	72	39	28.66	29.76	9.94	9	2	15
02	90	61	71	40	28.66	29.76	10.00	8	2	13
03	89	62	71	42	28.66	29.77	10.00	7	3	12
04	88	62	71	44	28.66	29.77	10.00	7	3	12
05	88	62	71	45	28.67	29.78	9.97	7	3	13
06	87	62	71	46	28.69	29.80	9.84	8	3	12
07	88	63	71	46	28.71	29.82	9.90	7	3	12
08	89	63	72	44	28.72	29.83	10.00	7	4	12
09	92	62	72	39	28.72	29.84	10.00	7	3	13
10	94	61	72	35	28.72	29.83	10.00	7	2	15
11	96	60	72	32	28.72	29.83	10.00	6	3	21
12	98	59	73	29	28.70	29.81	10.00	6	3	18
13	100	59	73	27	28.68	29.78	10.00	8	6	25
14	102	58	73	25	28.65	29.76	10.00	7	5	25
15	103	57	73	25	28.63	29.73	10.00	7	6	25
16	104	57	73	24	28.60	29.71	10.00	10	7	26
17	103	56	73	23	28.59	29.69	10.00	10	6	26
18	103	56	72	24	28.58	29.69	10.00	9	6	25
19	102	57	72	25	28.59	29.69	10.00	10	7	26
20	100	58	72	28	28.60	29.70	9.87	9	5	25
21	98	59	72	30	28.62	29.72	9.87	10	2	23
22	96	59	72	33	28.64	29.74	10.00	8	2	19
23	94	60	72	34	28.65	29.75	10.00	9	2	17
24	93	60	72	36	28.65	29.76	9.97	9	2	17

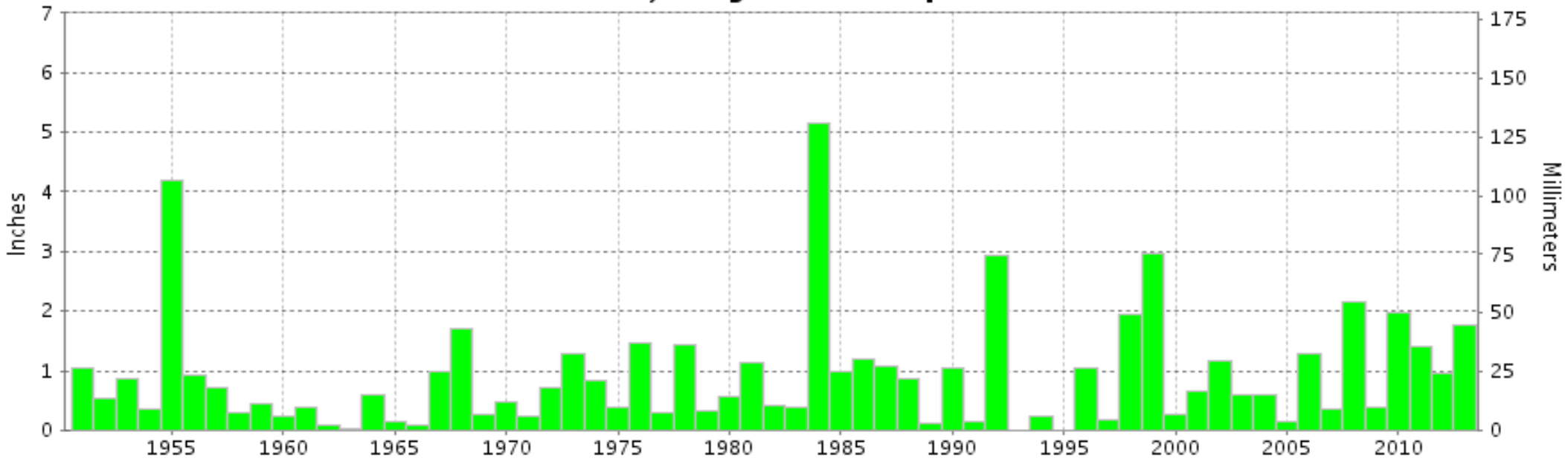
PHOENIX, AZ JULY Temperatures



Long-Term (1951-2013) Mean: 93.6

1971-2000 Normal: 94.8

PHOENIX, AZ JULY Precipitation



Long-Term (1951-2013) Mean Monthly Total: 0.92 **1971-2000 Normal: 1.05**

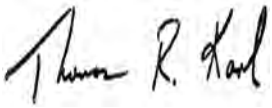
Published By: National Climatic Data Center

JULY 2013
PHOENIX, AZ

LOCAL CLIMATOLOGICAL DATA

NOAA, National Climatic Data Center

I certify that this is an official publication of the National Oceanic and Atmospheric Administration (NOAA). It is compiled using information from weather observing sites operated by NOAA-National Weather Service / Department Of Transportation-Federal Aviation Administration and received at the National Climatic Data Center (NCDC), Asheville, North Carolina 28801.



DIRECTOR

NCDC now offers free online access to the **Edited Local Climatological Data Publication.** Go to : **www.ncdc.noaa.gov** and choose Most Popular.

We welcome your questions or comments, please contact us at:
(828) 271-4800, option 2
Fax Number : 828-271-4876
TDD : (828) 271-4010
or Email : ncdc.orders@noaa.gov

NOAA\National Climatic Data Center
Attn: User Engagement & Services Branch
151 Patton Avenue
Asheville, NC 28801-5001

APPENDIX D

NOTICE OF PUBLIC COMMENT PERIOD

ADEQ Arizona Department of Environmental Quality

PUBLIC NOTICE

Request for Public Comments on Exceptional Events in the Maricopa County (Greater Phoenix) O3 Nonattainment Area

In 2005, Congress identified a need to account for events that result in exceedances of the National Ambient Air Quality Standards (NAAQS) that are exceptional in nature (e.g., not expected to reoccur or caused by acts of nature beyond man-made controls.) In response, EPA promulgated the Exceptional Events Rule (EER) to address exceptional events in 40 CFR Parts 50 and 51 on March 22, 2007 (72 FR 13560). On November 20, 2015, EPA released guidance on the preparation of exceptional events demonstrations for wildfire events that may influence ozone concentrations to State, tribal and local air agencies for review. The EER allows for states and tribes to "flag" air quality monitoring data as an exceptional event. If flagged, these data can be excluded from consideration in air quality planning if EPA concurs with the demonstration submitted by the flagging agency documenting that all procedural and technical requirements have been met.

Pursuant to 40 CFR 50.14(c)(3)(i), the Arizona Department of Environmental Quality (ADEQ) is soliciting comments on its final demonstration of an event that has caused elevated concentrations of Ozone (O3) in the Maricopa County (Greater Phoenix) O3 Nonattainment area on July 7, 2017. Additional, ADEQ is soliciting comments on its final addendum to the previously submitted demonstration for the event on June 20, 2015. ADEQ has decided to flag exceedance concentrations based on these analyses. A copy of these demonstrations and addendum are available for review beginning Thursday, May 17, 2018, on the ADEQ website at http://azdeq.gov/PN/o3_NAA. Interested parties can submit written comments throughout the comment period which will end at 5:00 p.m. on Saturday, June 16, 2016. Any comments received will be responded to and forwarded to EPA with the final demonstration.

Written comments should be addressed or E-mailed to:
Air Assessment Section, Arizona Department of Environmental Quality, 1110 W. Washington Street, Phoenix, AZ 85007, E-mail: exceptionalevents@azdeq.gov.

In addition to being available on-line, a copy of the analysis is available for review, Monday through Friday, 8:30 a.m. to 4:30 p.m., at the ADEQ Records Management Center 1110 W. Washington St., Phoenix, AZ, 85007, Attn: Records Center, (602) 771-4380, E-mail: recordscenter@azdeq.gov.

To request an auxiliary aid or service for accessible communication, please contact (602) 771-2215 or at ej2@azdeq.gov or dial 7-1-1 for TTY/TTD Services.

APPENDIX E

EXCEPTIONAL EVENT INITIAL NOTIFICATION FORM

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director

March 27, 2018

Elizabeth Adams
Environmental Protection Agency, Region 9
75 Hawthorne Street, Air-1
San Francisco, CA 94105

Re: Initial Notification of Intent to Pursue Wildfire-Ozone Exceptional Events for June 20, 2015, and July 7, 2017

Dear Ms. Adams:

Arizona Department of Environmental Quality (ADEQ) is hereby submitting our Initial Notification of Intent to Pursue Wildfire-Ozone Exceptional Events for June 20, 2015 and July 7, 2017. The Maricopa County, Phoenix-Mesa area is currently designated moderate nonattainment for the 2008 ozone NAAQS. Nonattainment areas nationwide are required to meet the 2008 ozone standards by their statutory attainment date, July 20, 2018. In preparation for this, ADEQ analyzed air quality data for years 2015-2017 to determine potential attainment. The area would have achieved a maximum design value of 0.075 ppm, save for two wildfire-related Exceptional Events that lead to ozone exceedances on June 20, 2015 and July 7, 2017. ADEQ is currently collaborating with Maricopa County Air Quality Department (MCAQD) and Maricopa Association of Governments (MAG) to develop demonstrations for both events. ADEQ aims to submit these demonstrations to EPA before the July 20, 2018 attainment deadline.

The Phoenix-Mesa area will meet the 2008 ozone NAAQS should EPA concur on both above mentioned exceptional events. Under the Clean Air Act, EPA is required to reclassify those areas that do not meet their statutory attainment date within six months (January 20, 2019). ADEQ is submitting these initial notifications to provide the necessary data and information to avoid EPA unnecessarily reclassifying the Phoenix-Mesa area as Serious for the 2008 ozone NAAQS. ADEQ will to seek a Clean Data Finding should EPA concur on the Exceptional Events. ADEQ will then submit to EPA a maintenance State Implementation Plan and a request to re-designate the Phoenix-Mesa area to maintenance/attainment.

Sincerely,

Timothy Franquist, Jr., Director
Air Quality Division

Cc: Jennifer Williams, EPA
Michael Flagg, EPA
Gwen Yoshimura, EPA
Meredith Kurpius, EPA
Matt Poppen, MAG
Lindy Bauer, MAG
Hether Kraus, Maricopa County

EE Initial Notification Summary Information — O_3 Template

Submitting Agency: **Arizona Department of Environmental Quality**
Agency Contact: **Jonny Malloy**
Date Submitted: **3/20/2018**
Applicable NAAQS: **2008 8-Hour O_3**
Affected Regulatory Decision[1]: **Maricopa County Non-Attainment**
(for classification decisions, specify level of the classification with/without EE concurrence)
Area Name/Designation Status: **Maricopa County – Phoenix-Mesa (Moderate)**
Design Value Period (list three year period): **2015-2017**
(where there are multiple relevant design value periods, summarize separately)

A) Information specific to each flagged site day that may be submitted to EPA in support of the affected regulatory decision listed above

Date of Event	Type of Event (high wind, volcano, wildfires/prescribed fire, other[2])	AQS Flag	Site AQS ID	Site Name	Exceedance Concentration (with units)	Notes (e.g. event name, links to other events)
July 7, 2017	**Wildfire**	**RT**	**04-013-3002**	**Central Phoenix**	**78 ppb**	**State of Arizona Exceptional Event Documentation of wildfire related ozone exceedance on July 7, 2017 in the Maricopa County Ozone Non-attainment Area.**
July 7, 2017	**Wildfire**	**RT**	**04-013-4010**	**Dysart**	**87 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-2001**	**Glendale**	**79 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-1003**	**Mesa**	**78 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-1004**	**North Phoenix**	**85 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-9997**	**Phoenix Supersite**	**87 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-2005**	**Pinnacle Peak**	**77 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-4003**	**South Phoenix**	**77 ppb**	
July 7, 2017	**Wildfire**	**RT**	**04-013-0019**	**West Phoenix**	**84 ppb**	

B) Violating Sites Information

(listing of all violating sites in the planning area, regardless of operating agency, and regardless of whether or not they are impacted by EEs)

Site/monitor (AQS ID and POC)	Design Value (without EPA concurrence on any of the events listed in table A above)	Design Value (with EPA concurrence on all events listed in table A above)
Mesa (04-013-1003)	**76**	**76**
Phoenix Supersite (04-013-9997)	**76**	**75**
Pinnacle Peak (04-013-2005)	**76**	**75**

[1] designation, classification, attainment determination, attainment date extension, or finding of SIP inadequacy leading to SIP call

[2] Provide additional information for types of event described as "other"

C) Summary of Maximum Design Value (DV) Site Information (Effect of EPA Concurrence on Maximum Design Value Site Determination)

(Two highest values from Table B)

Maximum DV site (AQS ID) **without EPA concurrence** on any of the events listed in table A above	Design Value 76	Design Value Site **Mesa (04-013-1003)**	**The Mesa site's Design Value would be 75 with EPA concurrence of June 20, 2015 demonstration.**
Maximum DV site (AQS ID) **with EPA concurrence** on all events listed in table A above	Design Value 75	Design Value Site **Phoenix Supersite (04-013-9997) & Pinnacle Peak (04-013-2005)**	Comment

D) List of any sites (AQS ID) within planning area with invalid design values (e.g., due to data incompleteness)

APPENDIX F

DIURNAL POLLUTANT CONCENTRATIONS AT EXCEEDING MONITORS ON JULY 6-8, 2017

Introduction

This appendix contains diurnal pollutant concentrations figures for ozone, nitrogen dioxide (NO_2), particulate matter less than 2.5 micrometers ($PM_{2.5}$) and carbon monoxide (CO) where available at the nine monitors which exceeded the 2008 ozone standard (0.075 ppm) in the Maricopa eight-hour ozone nonattainment area on July 6-8. 2017. Not all monitors collect data on all four pollutants. The nine monitors and the pollutant data they monitor are listed below:

(CP)	Central Phoenix (04-013-3002):	CO, NO_2 and Ozone
(DY)	Dysart (04-013-4010):	Ozone
(GL)	Glendale (04-013-2001):	Ozone and $PM_{2.5}$
(ME)	Mesa[1] (04-013-1003):	Ozone and $PM_{2.5}$
(NP)	North Phoenix (04-013-1004):	Ozone and $PM_{2.5}$
(PH)	Phoenix Supersite (04-013-9997):	CO, NO_2, Ozone and $PM_{2.5}$
(PP)	Pinnacle Peak (04-013-2005):	Ozone
(SP)	South Phoenix[2] (04-013-4003):	Ozone and $PM_{2.5}$
(WP)	West Phoenix (04-013-0019):	CO, NO_2, Ozone and $PM_{2.5}$

The diurnal concentrations on July 6-8, 2017 at each monitoring site are presented alongside the 5^{th}, 50^{th} and 95^{th} percentile concentrations from two monitoring-site specific data sources. The first data source calculates the percentiles based upon data from the monitoring site for the month of July only in years 2013-2017 (designed to limit the comparison to days with similar meteorology). The second data source calculates the percentiles based upon data from the monitoring site for the months of May-August in years 2013-2017 (designed to look at the months when over 90% of the ozone exceedances occur). In calculating the percentiles, the diurnal monitoring data from the two data sources was also grouped by workdays (Monday-Friday) and weekend days (Saturday-Sunday) to account for the reduction in anthropogenic emissions of ozone precursors that occurs on weekend days as compared to workdays in the Maricopa nonattainment area.

Diurnal data presented in the main body of this demonstration is calculated using only monitoring data from the month of July in years 2013-2017. Additionally, in calculating the percentiles, the diurnal monitoring data is not grouped, but calculated individually for each day (i.e. the 5^{th} percentile values on July 7, 2017 (a Friday) at the West Phoenix monitor are calculated using only diurnal concentrations from West Phoenix monitoring data for Fridays in July, 2013-2017).

The diurnal data for July 6-8, 2017 and the associated percentiles are presented below in a series of 18 figures (2 for each monitoring site). Each of the following figures contains a maximum of four graphs per monitoring site (if all four pollutants area present at the monitoring site). Each monitoring site will have two figures, one for the data set based upon July 2013-2017 and one for the data set based upon May-August 2013-2017.

[1] Summertime CO only available in 2017.
[2] Summertime CO only available in 2017.

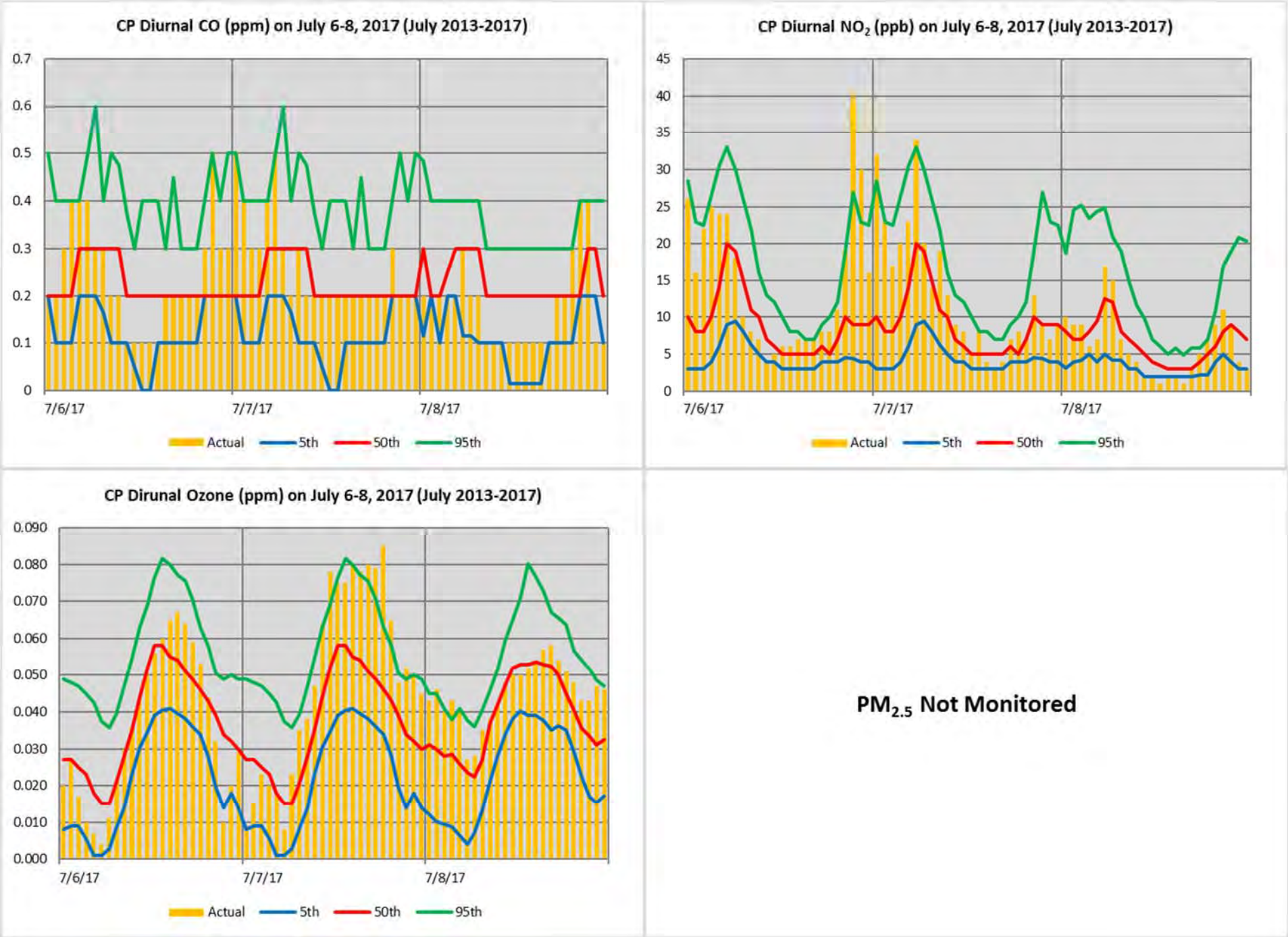


Figure 1. Diurnal Pollutant Concentrations at the Central Phoenix Monitor on July 6-8, 2017 (July 2013-2017).

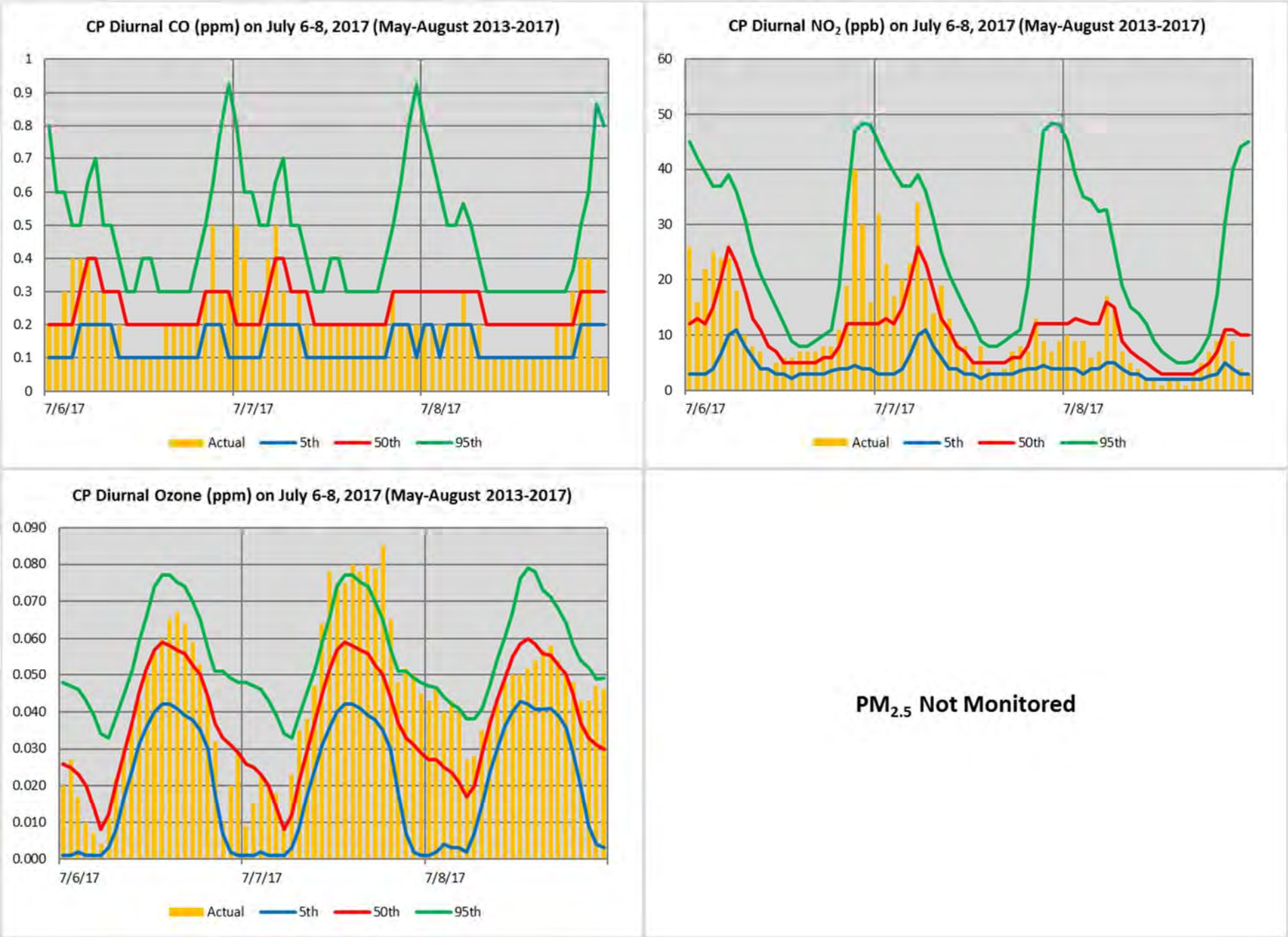
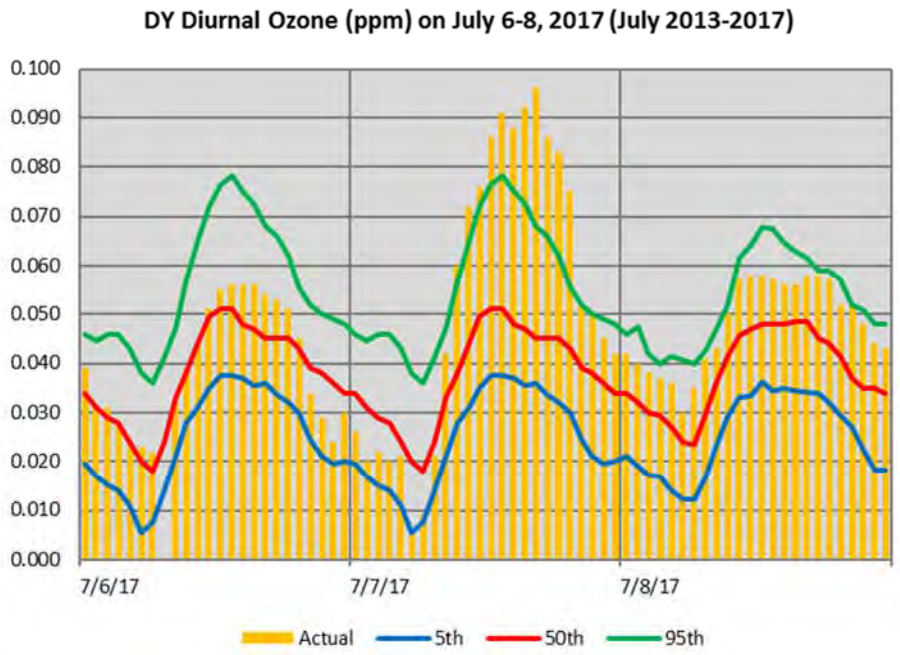


Figure 2. Diurnal Pollutant Concentrations at the Central Phoenix Monitor on July 6-8, 2017 (May-August 2013-2017).

CO Not Monitored

NO_2 Not Monitored

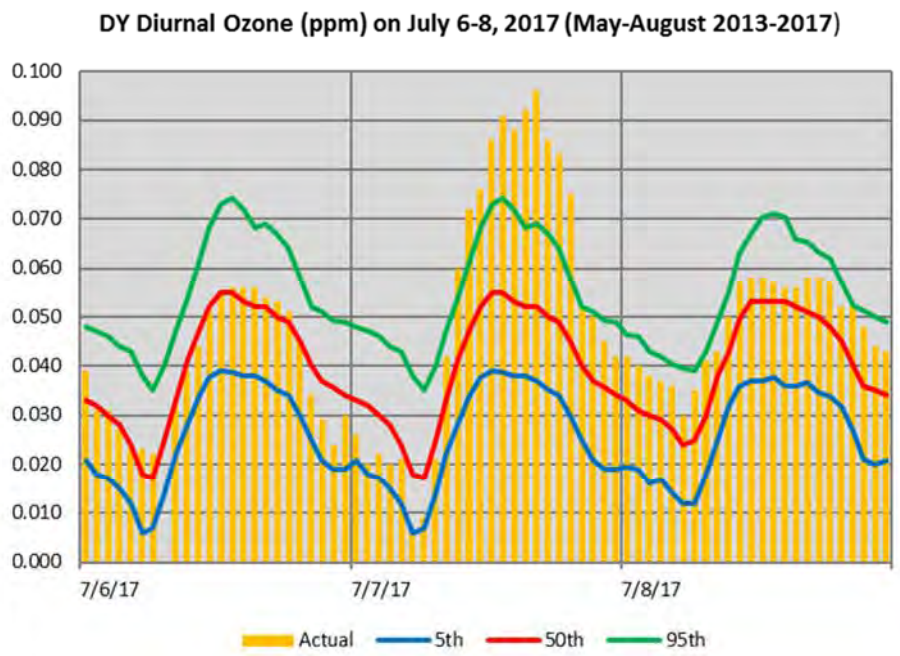


$PM_{2.5}$ Not Monitored

Figure 3. Diurnal Pollutant Concentrations at the Dysart Monitor on July 6-8, 2017 (July 2013-2017).

CO Not Monitored

NO_2 Not Monitored

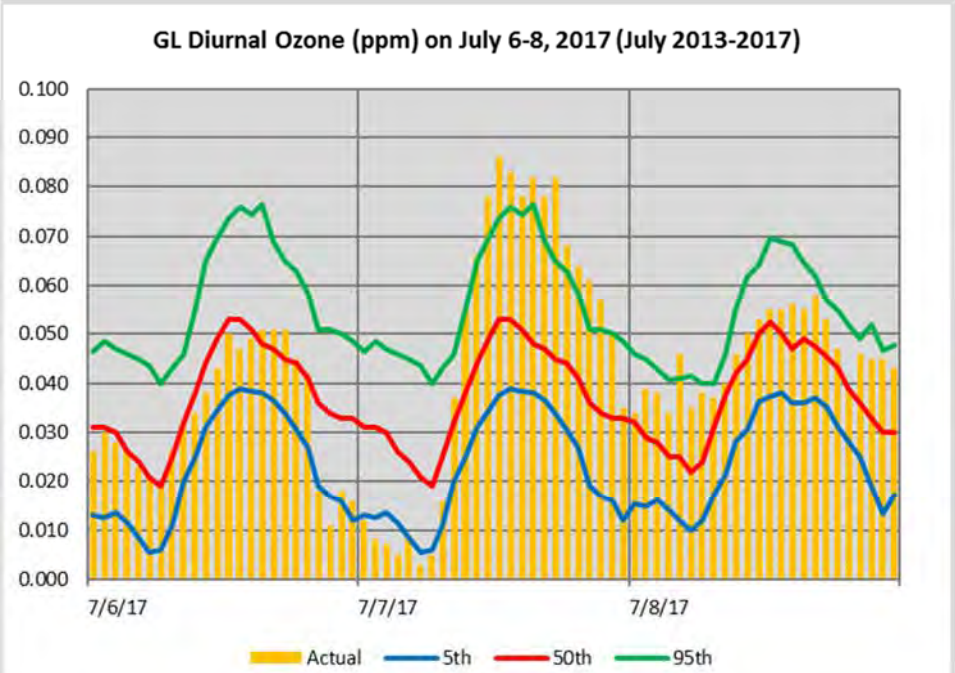


$PM_{2.5}$ Not Monitored

Figure 4. Diurnal Pollutant Concentrations at the Dysart Monitor on July 6-8, 2017 (May-August 2013-2017).

CO Not Monitored

NO_2 Not Monitored



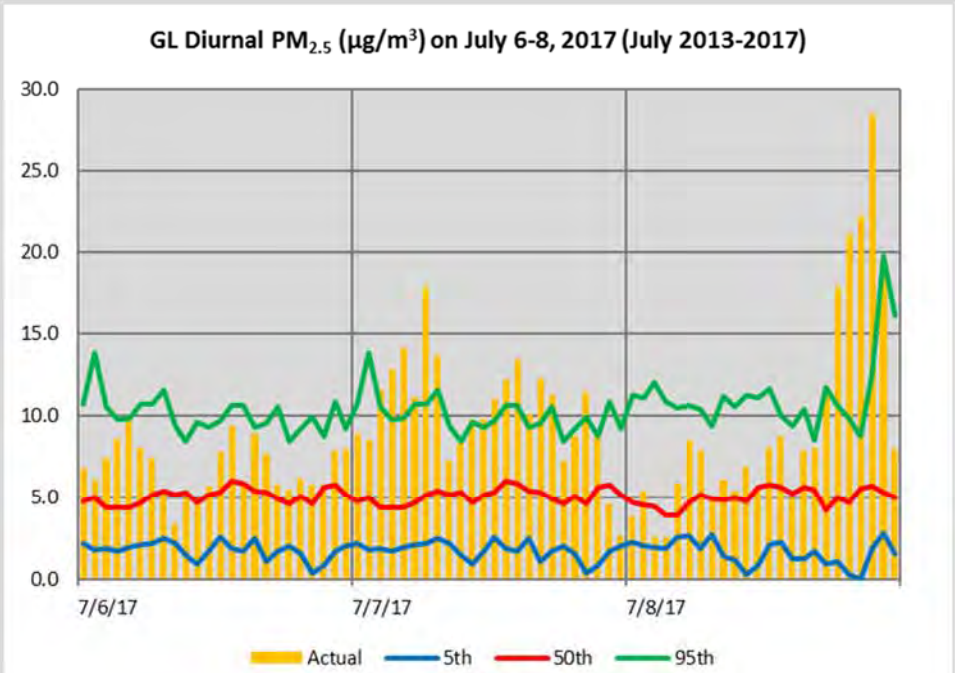
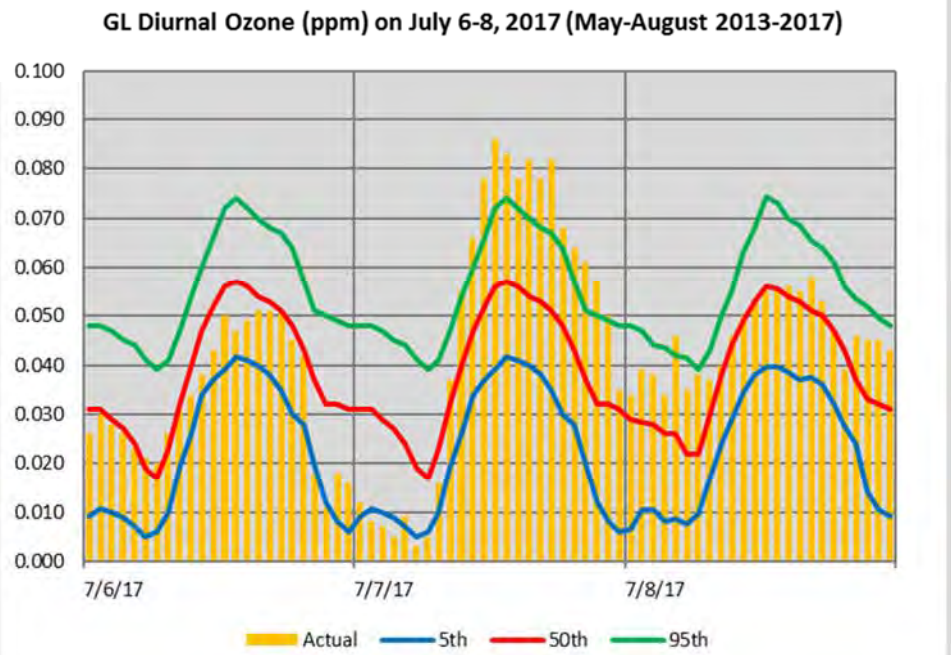


Figure 5. Diurnal Pollutant Concentrations at the Glendale Monitor on July 6-8, 2017 (July 2013-2017).

CO Not Monitored

NO_2 Not Monitored



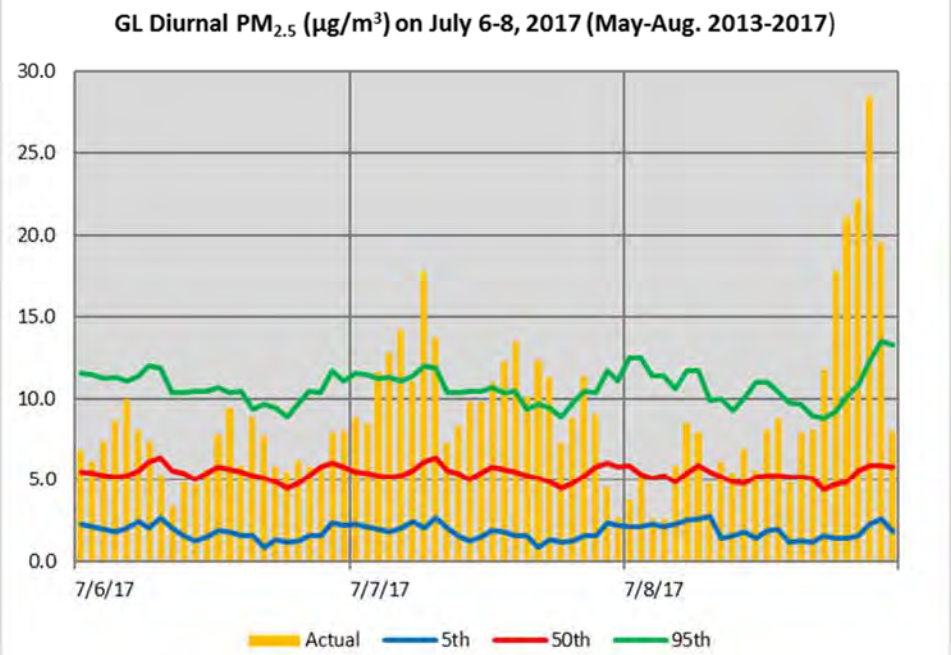
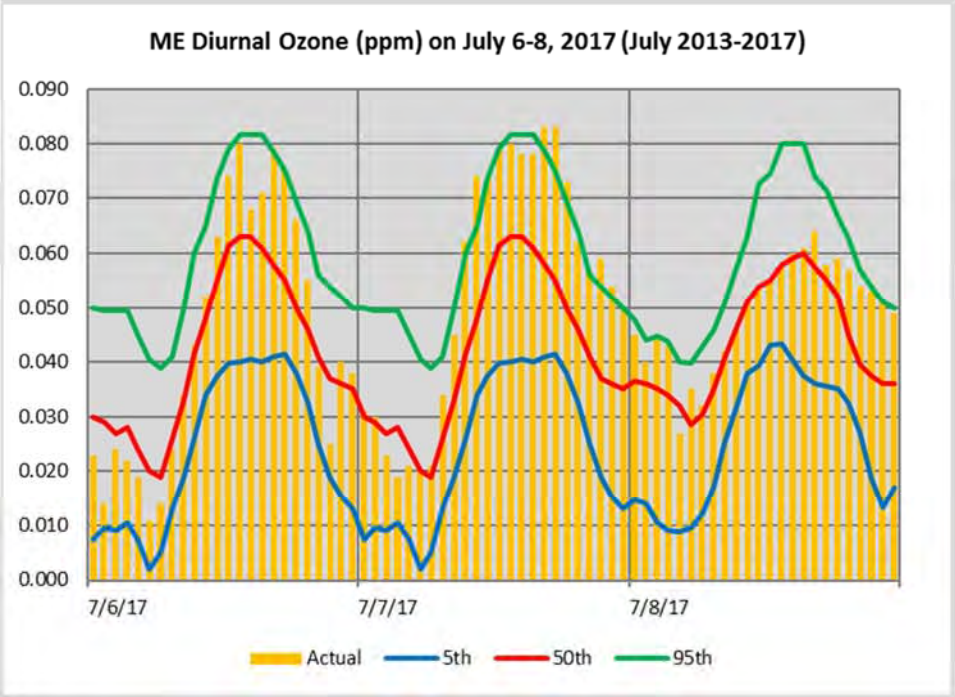


Figure 6. Diurnal Pollutant Concentrations at the Glendale Monitor on July 6-8, 2017 (May-August 2013-2017).

CO Not Monitored

NO_2 Not Monitored



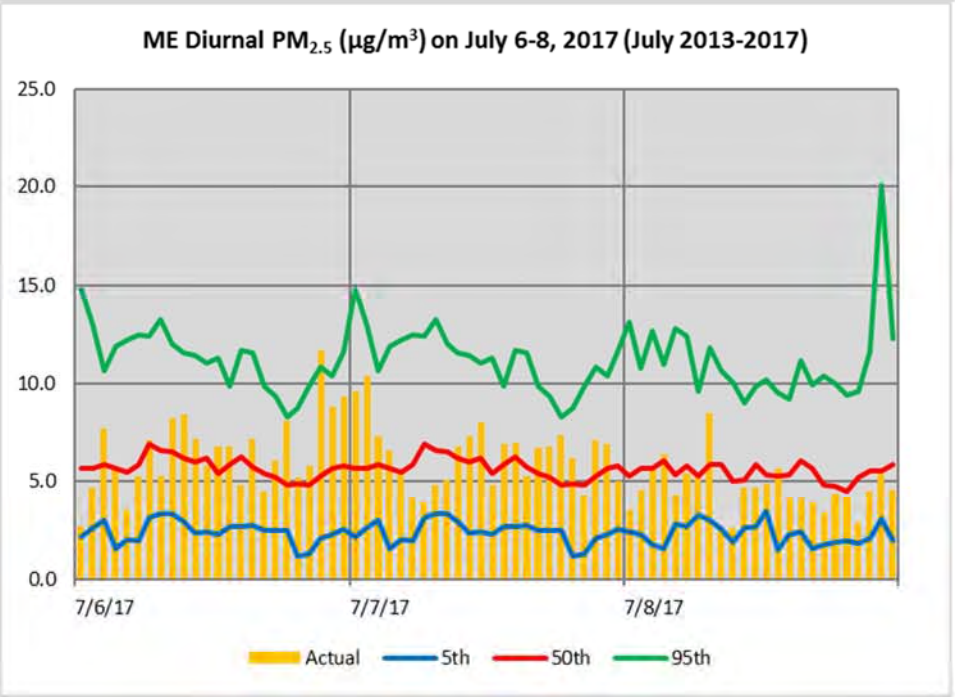
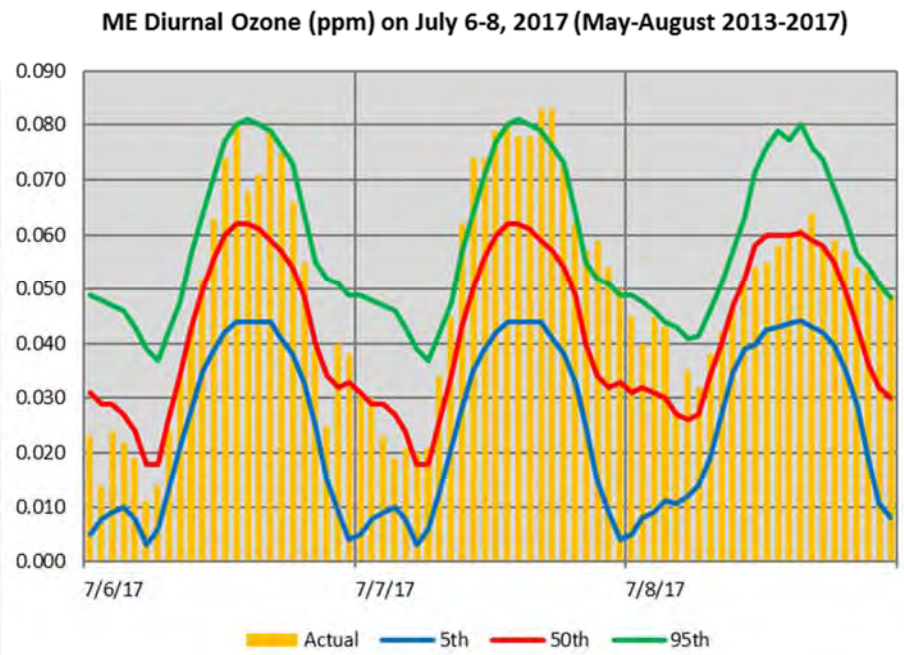


Figure 7. Diurnal Pollutant Concentrations at the Mesa Monitor on July 6-8, 2017 (July 2013-2017).

CO Not Monitored

NO_2 Not Monitored



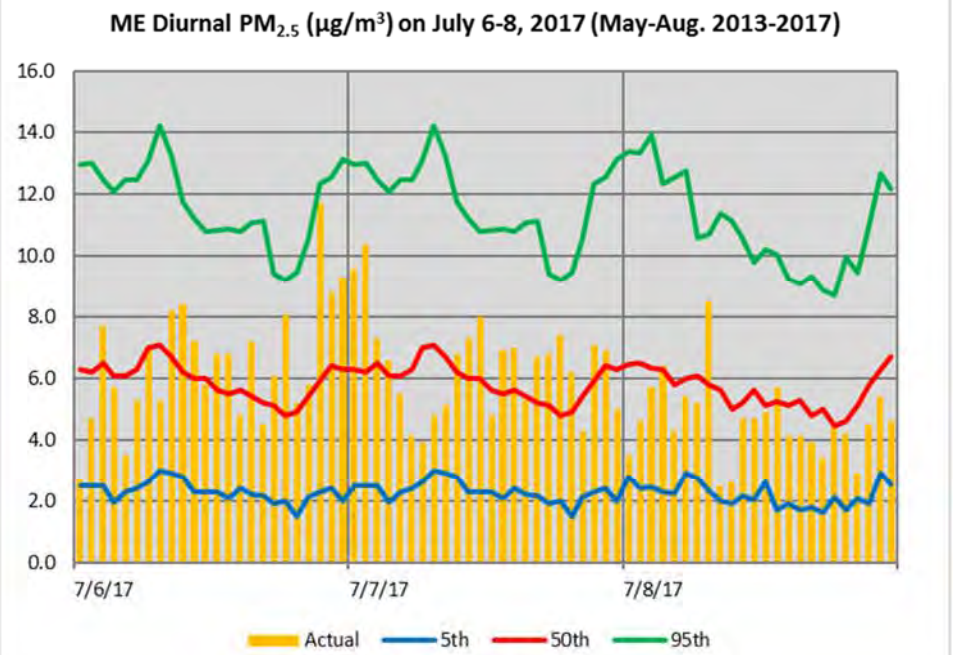
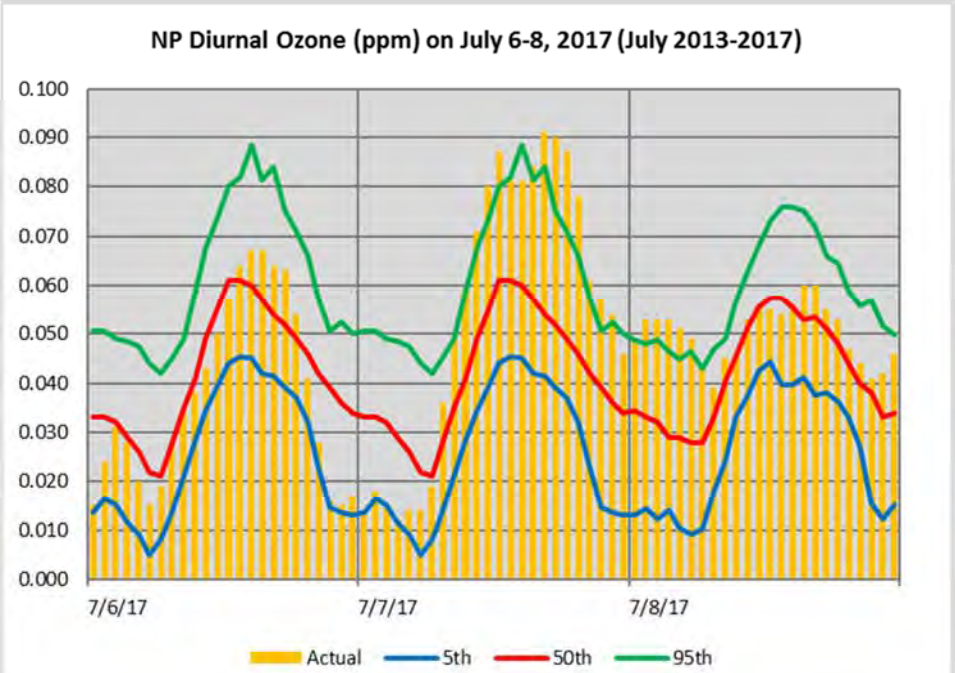


Figure 8. Diurnal Pollutant Concentrations at the Mesa Monitor on July 6-8, 2017 (May-August 2013-2017).

CO Not Monitored

NO_2 Not Monitored



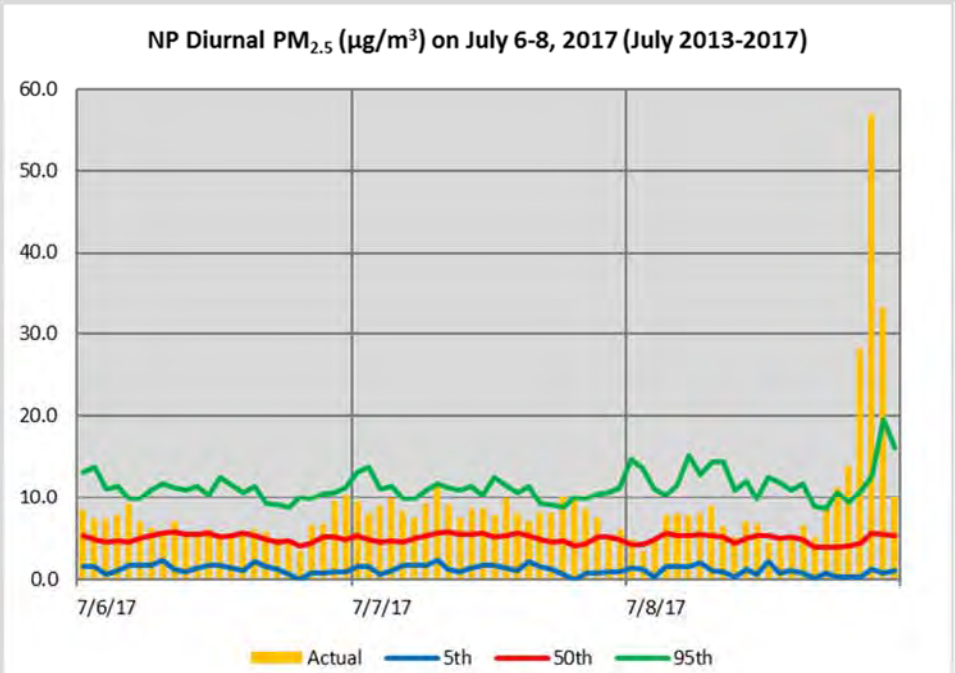
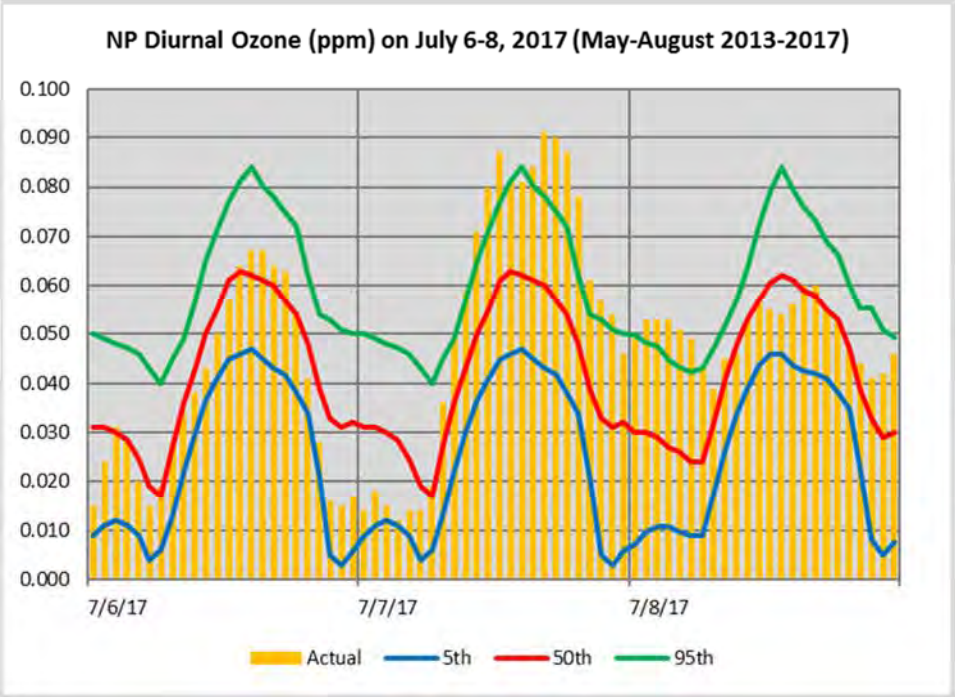


Figure 9. Diurnal Pollutant Concentrations at the North Phoenix Monitor on July 6-8, 2017 (July 2013-2017).

CO Not Monitored

NO_2 Not Monitored



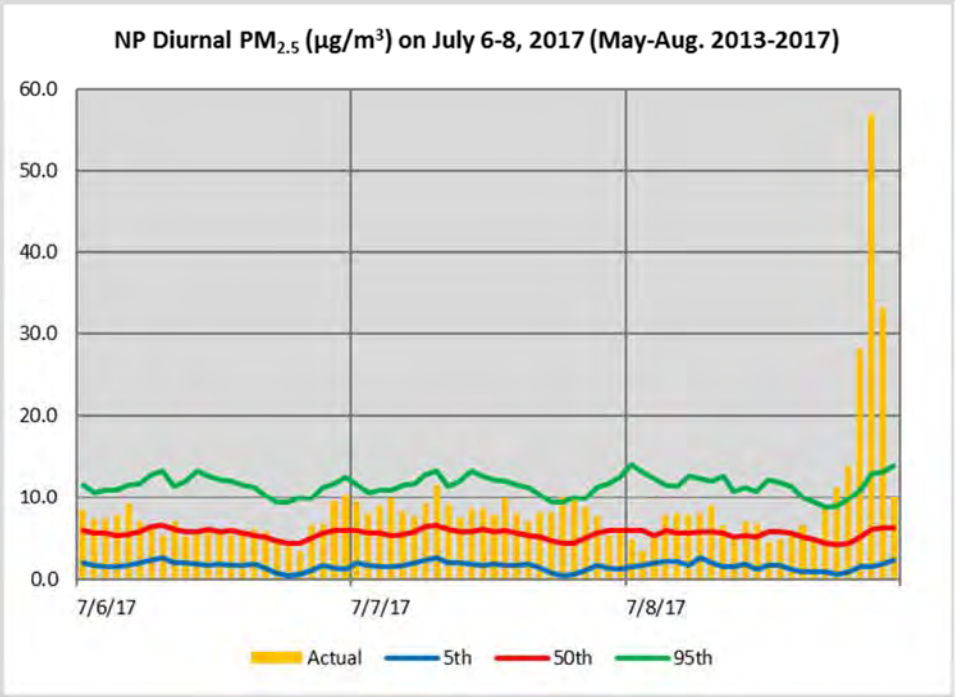


Figure 10. Diurnal Pollutant Concentrations at the North Phoenix Monitor on July 6-8, 2017 (May-August 2013-2017).

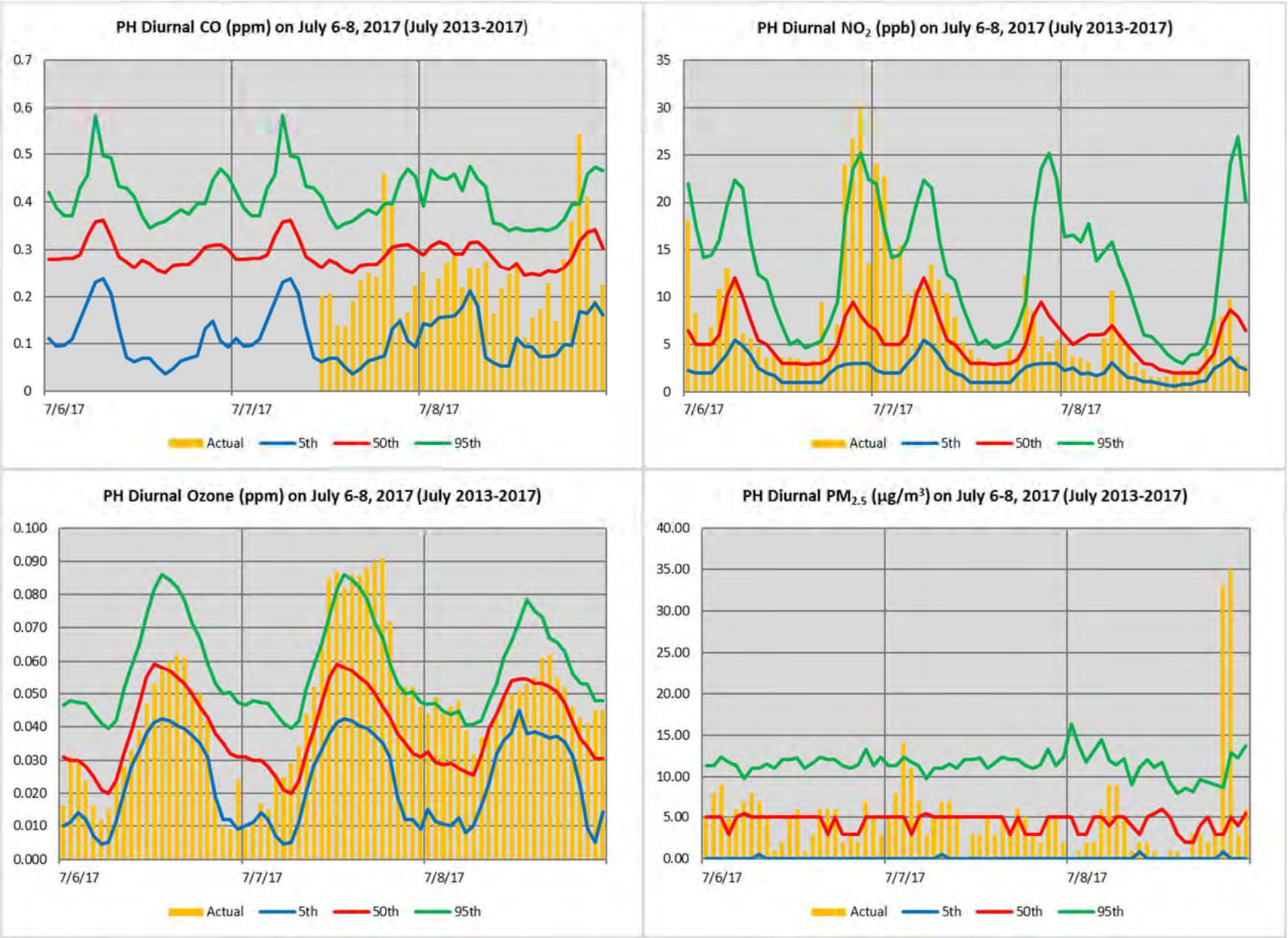


Figure 11. Diurnal Pollutant Concentrations at the Phoenix Supersite Monitor on July 6-8, 2017 (July 2013-2017).

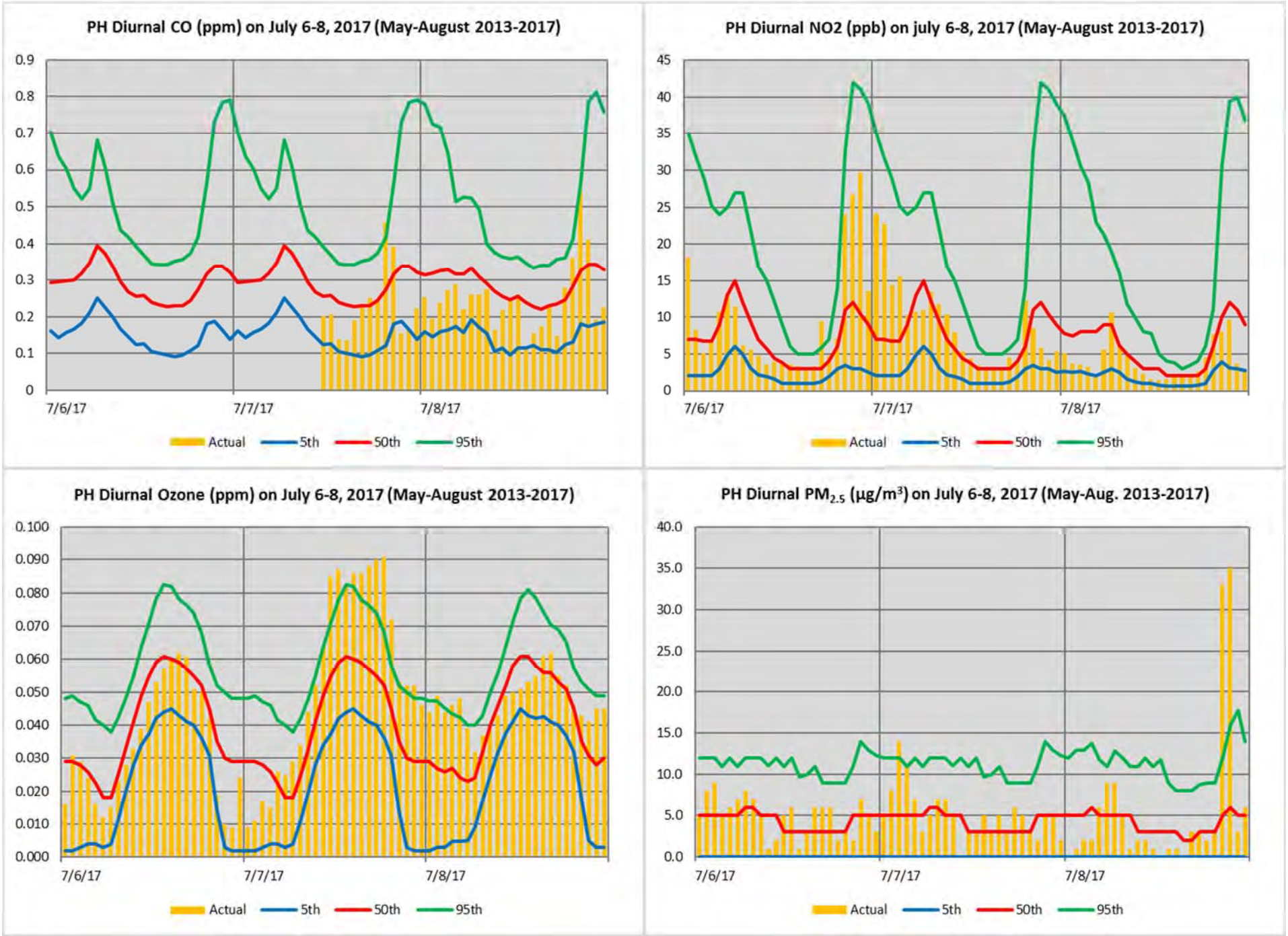
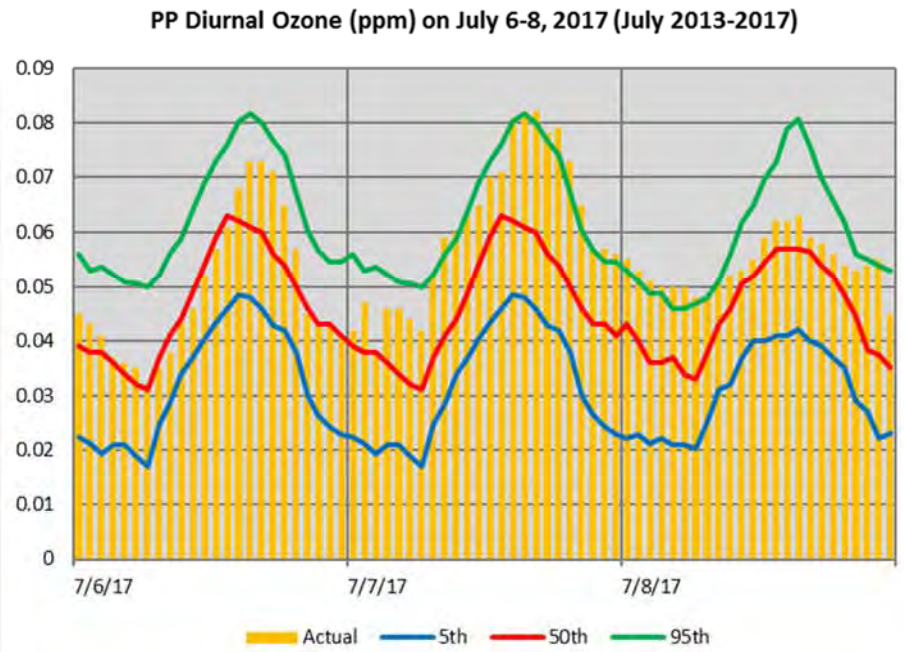


Figure 12. Diurnal Pollutant Concentrations at the Phoenix Supersite Monitor on July 6-8, 2017 (May-August 2013-2017).

CO Not Monitored

NO_2 Not Monitored

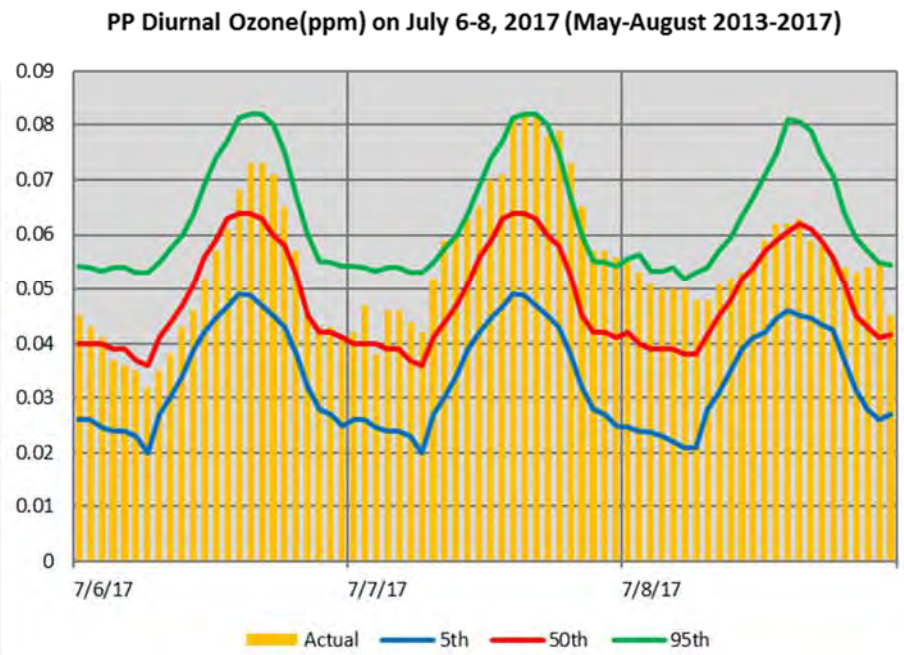


$PM_{2.5}$ Not Monitored

Figure 13. Diurnal Pollutant Concentrations at the Pinnacle Peak Monitor on July 6-8, 2017 (July 2013-2017).

CO Not Monitored

NO_2 Not Monitored

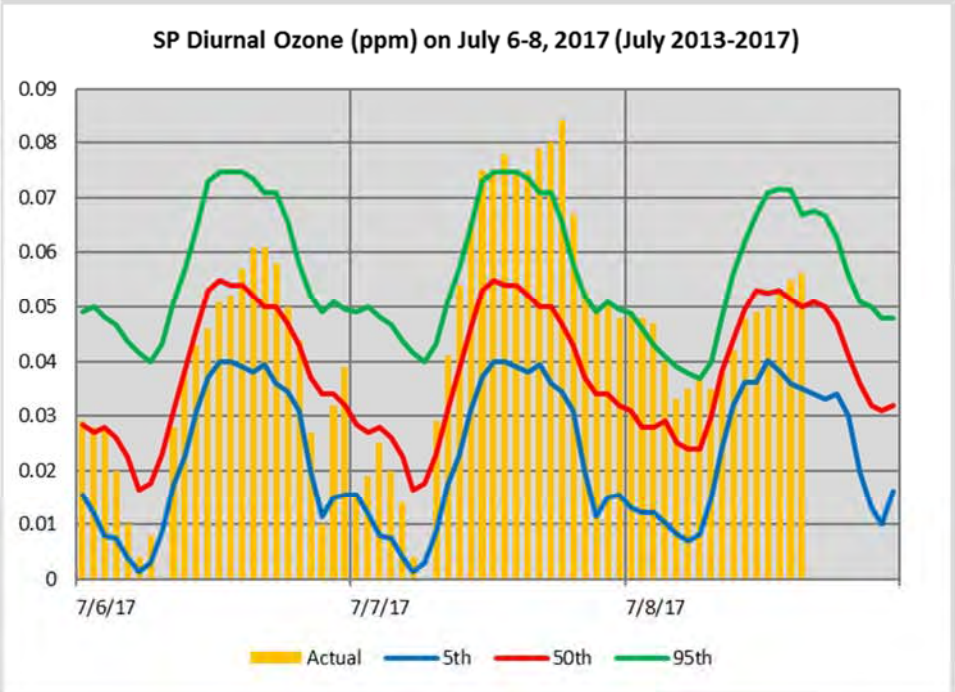


$PM_{2.5}$ Not Monitored

Figure 14. Diurnal Pollutant Concentrations at the Pinnacle Peak Monitor on July 6-8, 2017 (May-August 2013-2017).

CO Not Monitored

NO_2 Not Monitored



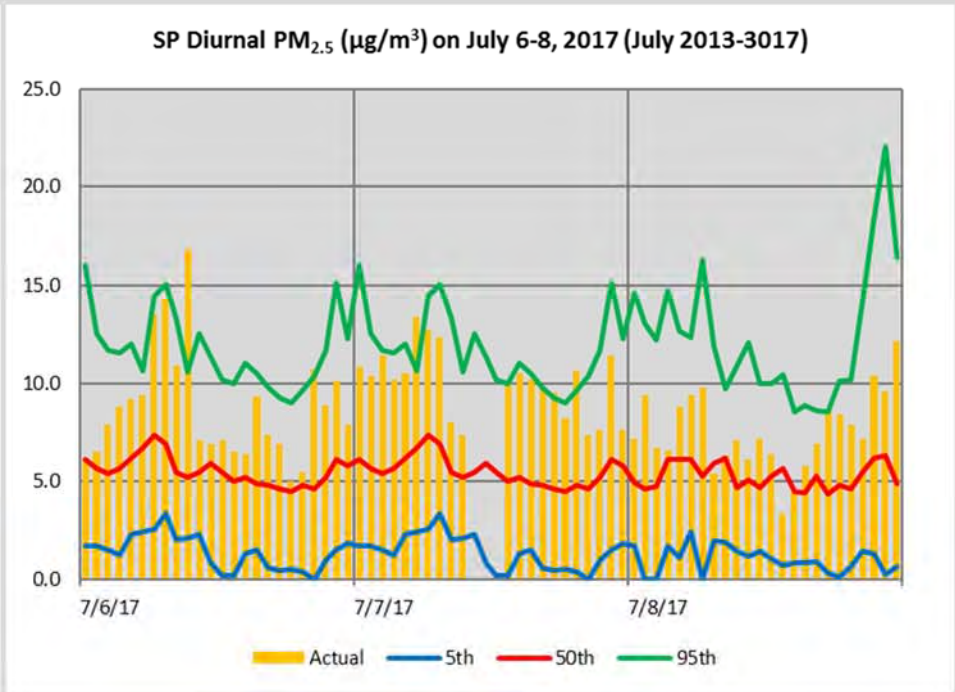
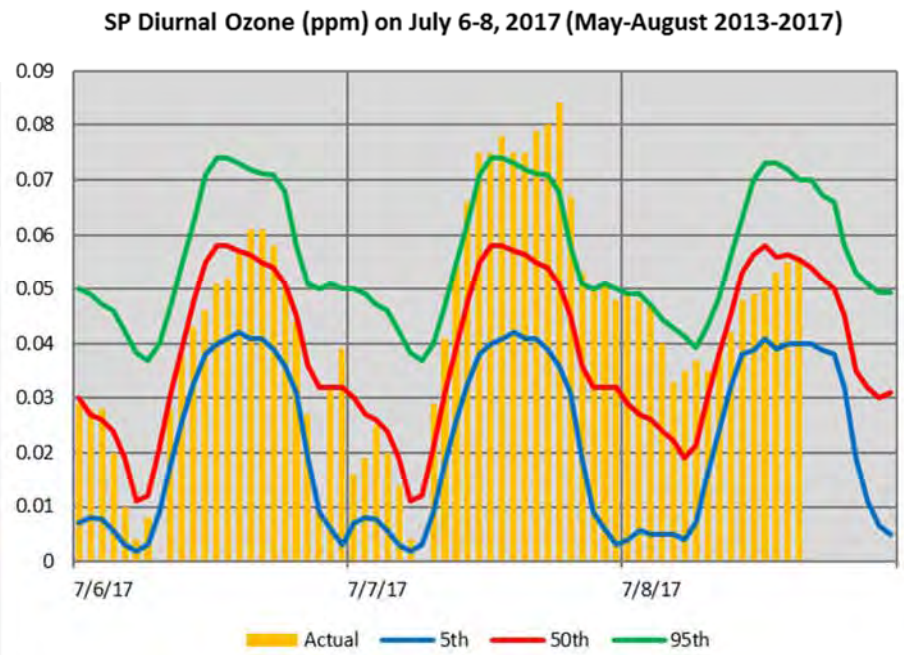


Figure 15. Diurnal Pollutant Concentrations at the South Phoenix Monitor on July 6-8, 2017 (July 2013-2017).

CO Not Monitored

NO_2 Not Monitored



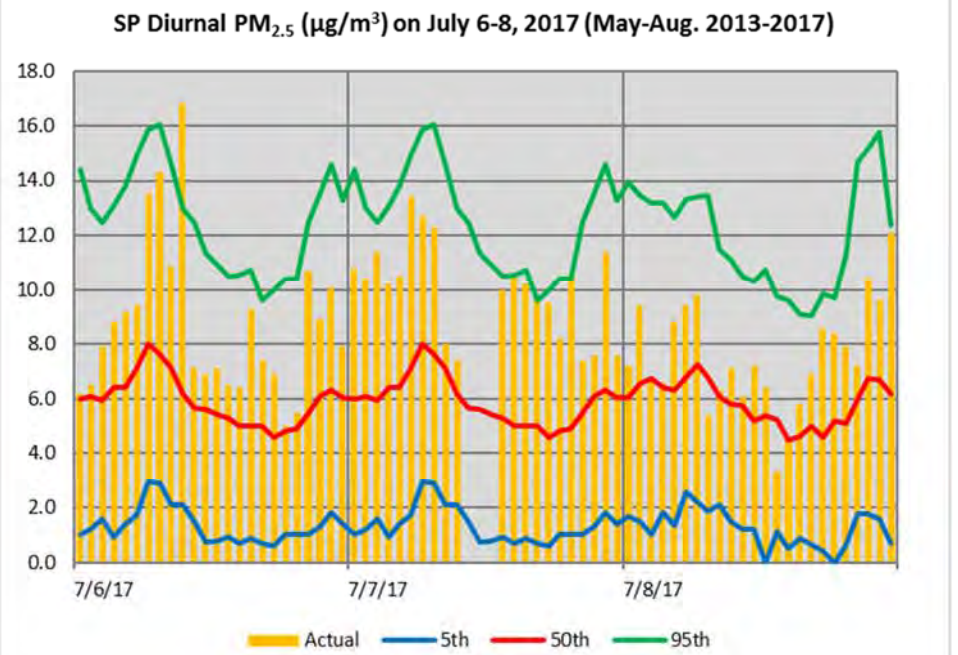


Figure 16. Diurnal Pollutant Concentrations at the South Phoenix Monitor on July 6-8, 2017 (May-August 2013-2017).

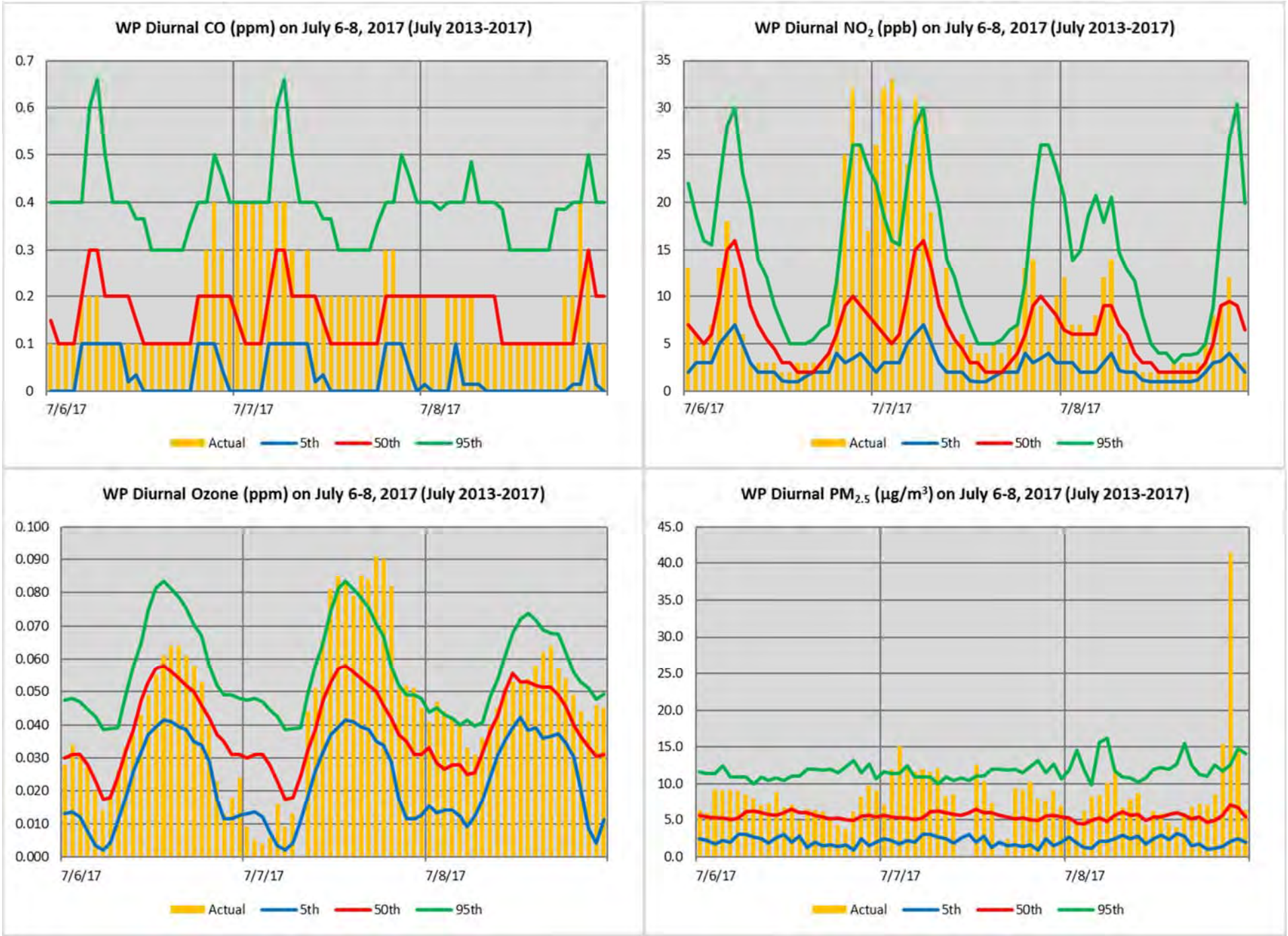


Figure 17. Diurnal Pollutant Concentrations at the West Phoenix Monitor on July 6-8, 2017 (July 2013-2017).

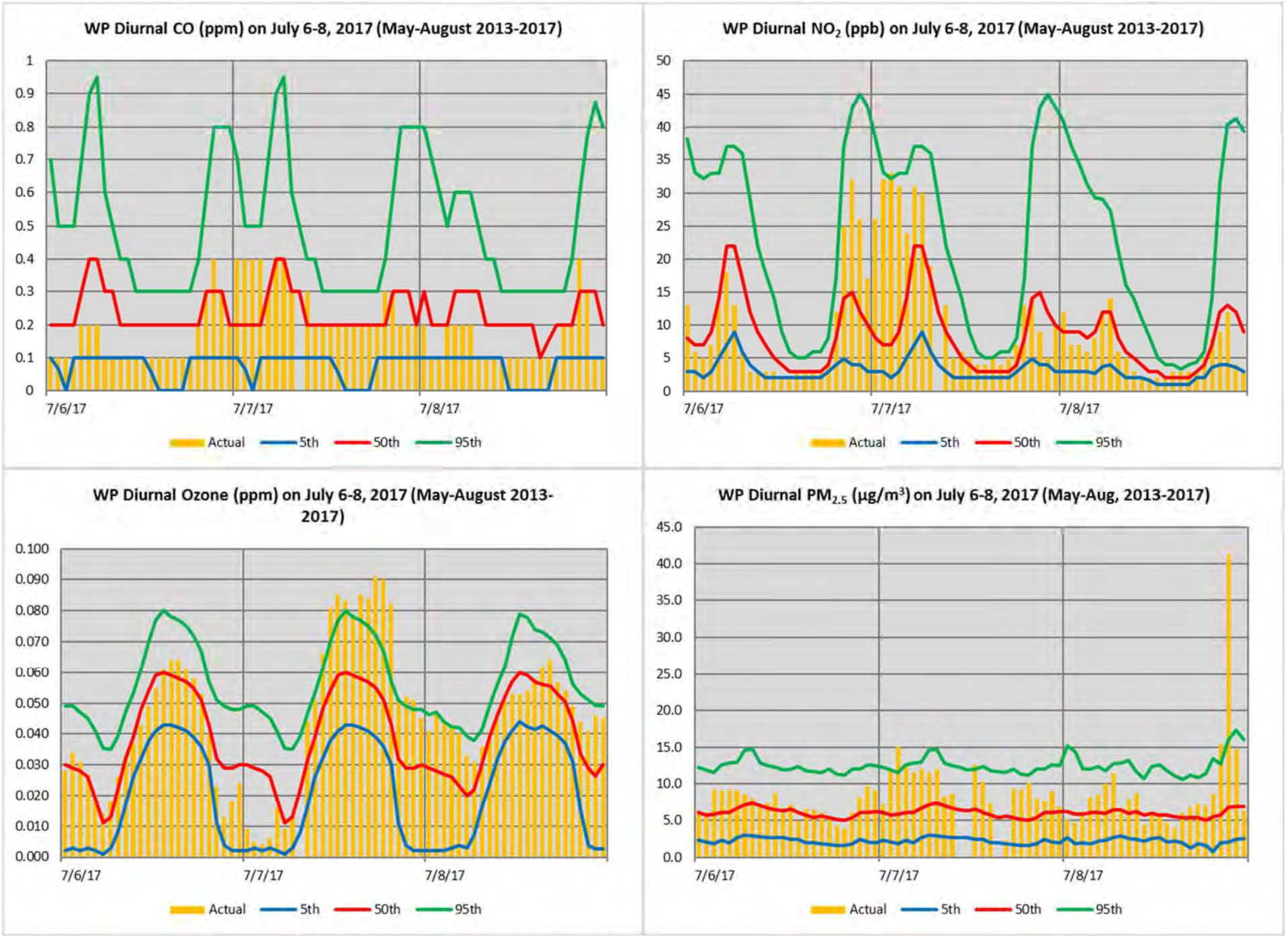


Figure 18. Diurnal Pollutant Concentrations at the West Phoenix Monitor on July 6-8, 2017 (May-August 2013-2017).